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Hardware vs. Manpower Comparability Methodology

Step 4: Training Resource Requirements Analysis
Volume 5

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Manned Systems Group
Systems Research Laboratory

U.S. Army Research Institute for the Behavioral and Social Sciences

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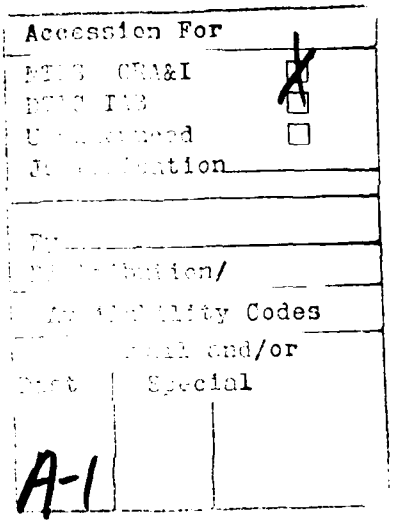

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Step 4: Training Resource Requirements Analysis
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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The Army Hardware vs. Manpower (HARDMAN) Comparability Methodology (HCM) is a six-step process for determining a weapon system's manpower, personnel, and training (MPT) requirements. It provides a structured approach for early MPT estimation based on comparability analysis, an analytic system that uses knowledge about similar existing systems and technological growth trends to project the MPT requirements of proposed new systems. The HCM's six interrelated steps are Systems Analysis, Manpower Requirements Analysis, Personnel Pipeline Analysis, Training Resource Requirements Analysis, Impact Analysis, and Tradeoff Analysis. The HCM has been successfully applied to a range of weapons systems, including air, armor, artillery, infantry, air defense, command and control, and intelligence systems.

The Product Improvement Program for HCM made major revisions to the existing HCM Guide. The scope has been expanded to include several new areas; existing procedures have been
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19. ABSTRACT (Continued)

revised, refined, and clarified; and the entire Guide has been rewritten to achieve greater clarity, consistency, and completeness.

This volume addresses methods of determining training resource requirements for the new system. Training tasks, courses of instruction, and resource requirements are analyzed.

FOREWORD

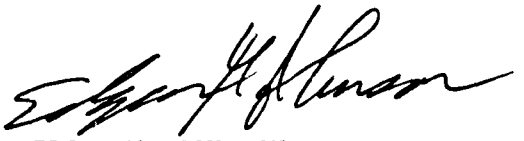
The goal of the Army HARDMAN methodology is to provide timely information on the manpower, personnel, and training (MPT) resource requirements of emerging weapon systems. This information supports decisions on the research, development, and acquisition issues affecting emerging systems, as well as planning required for effective supportability of these systems in MPT and logistics areas. HARDMAN is a key element of the Army MANPRINT program.

This guide consists of seven volumes, a manager's guide and one volume for each of the six steps of the HARDMAN methodology. The manager's guide is intended for the use of the manager in the planning, scoping, and costing of the HARDMAN analysis. The other six volumes are for the analysts who will perform the analytic procedures in each step of the methodology.

This volume is the manager's guide. It deals with the planning and conducting of the HARDMAN analysis and the estimation of the resource requirements for the analysis. Development of the quality assurance plan and the consolidated database are explained. The relationship of HARDMAN results to various Army MPT documents is also discussed.

This guide is a major revision and expansion of the existing five-volume HARDMAN guide. The scope has been altered to include procedures for assessing combat damage workload and depot-level manpower requirements, and estimating training resource requirements associated with new training concepts and other procedures not included previously. Existing procedures have been clarified, simplified, or expanded to make them more useful to the analyst and to make HARDMAN a more effective tool for the Army.

The development of the guide was part of the System Research Laboratory's Third Generation MANPRINT Estimation Research Task. Most of the expansion and enhancement of the HARDMAN method has been based on recommendations of the Soldier Support Center, National Capital Region (SSC-NCR), which has overseen application of the method to numerous Army weapon systems. Staff from the SSC-NCR attended all the in-progress reviews for this effort and have been briefed on the final product. In addition, personnel from the TRADOC Analysis Command, White Sands Missile Range, TRADOC Headquarters, the U.S. Army Human Engineering Laboratory, and other Army agencies have been briefed on the revised HARDMAN guide to make them aware of its enhanced capability to provide MPT information for emerging systems.



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HARDWARE VS. MANPOWER COMPARABILITY METHODOLOGY (STEP 4: TRAINING RESOURCE REQUIREMENTS ANALYSIS) (VOLUME 5 OF 7)

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HARDWARE VS. MANPOWER COMPARABILITY METHODOLOGY
(STEP 4: TRAINING RESOURCE REQUIREMENTS ANALYSIS)
(VOLUME 5 OF 7)

INTRODUCTION

Training Resource Requirements Analysis" is the fourth step in the Army HARDMAN Comparability Methodology (HCM). The HCM is a Manpower and Personnel Integration (MANPRINT) tool that addresses manpower, personnel, and training (MPT) issues associated with new or improved weapon systems.

This document is one of seven documents that contain the steps necessary to conduct an HCM analysis:

"Overview and Manager's Guide

"Step 1: Systems Analysis"

"Step 2: Manpower Requirements Analysis"

"Step 3: Personnel Pipeline Analysis"

"Step 4: **Training Resource Requirements Analysis"**

"Step 5: Impact Analysis"

"Step 6: Tradeoff Analysis"

How this Document is Organized

An HCM step consists of an overview and substeps. A substep contains an overview and action steps. Each action step includes a discussion of what the analyst will accomplish in the action step; procedures that describe, step-by- step, how to accomplish the action step; and examples that feature actual Army systems. The table on the following page summarizes the procedures a training analyst must undertake to accomplish this HCM step.

Worksheets are used extensively throughout the guide. These worksheets help the analysis team organize and format information and serve as an audit trail of the analysis. Blank copies of these worksheets are located at the end of each substep.

Each HCM step has its own unique appendices. These appendices include articles that provide additional information about the step; a list of acronyms; a glossary; a crosswalk between the HCM and the Man Integrated Systems Technology (MIST); and a crosswalk between the HCM and MPT-related Army documents, for example, Basis of Issue Plans (BOIPs) and the Qualitative and Quantitative Personnel Requirements Information (QQPRI). (Each step's appendix section does not include a list of references. The "Overview and Manager's Guide" includes a complete list of references for all seven volumes.)

Step 4's Substeps and Action Steps

In This Substep	The Analyst Will	By Completing this Action Step
4.1	Identify Training Data	Develop Training Data Source Indexes Determine New System Training Concept
4.2	Evaluate Tasks	Determine Predecessor System Tasks Determine BCS Tasks Determine Proposed System Tasks Select Tasks for Training and Training Location
4.3	Evaluate Courses of Instruction	Determine Predecessor System Courses of Instruction Determine BCS Courses of Instruction Determine Proposed System Courses of Instruction Assess Aptitude and Mental Category Requirements
4.4	Determine Course Material Requirements	Determine Training Device/ Equipment Requirements Determine Petroleum, Oils, and Lubricants Requirements Determine Ammunition Requirements Determine Facility Requirements

Step 4's Substeps and Action Steps (Continued)

In This Substep	The Analyst Will	By Completing this Action Step
4.5	Determine Course Resource Data	Determine Known Course Resource Data Determine Comparable Course Resource Data
4.6	Determine Student Input	Determine Normalized Graduates Calculate Student Input
4.7	Determine Course Resource Requirements	Determine Training Man-Day Requirements Calculate Monthly Instructor Contact Hours Calculate Instructor Requirements
4.8	Calculate Course Cost Requirements	Calculate Fixed and Variable Cost Percentages Calculate Cost Per Graduate Determine Annual Course Costs
4.9	Determine Unit Training Products	Identify Candidate Training Products Calculate Unit Training Product Resource Requirements

STEP 4
TRAINING RESOURCE REQUIREMENTS ANALYSIS

Overview

In this step the training analyst determines the New System's training requirements. These training requirements include the system's tasks, courses of instruction, and resource requirements. Figure 4-1 is an overview of this step.

The Training Resource Requirements Analysis (TRRA) consists of nine substeps, which are clustered into six analysis phases, as shown in Figure 4-2. The six phases are:

(1) Training Data Identification
(2) Task Comparability Analysis
(3) Unit Training Products Determination
(4) Course Requirements Analysis
(5) Course Material Requirements Determination
(6) Course Cost and Resources Determination

The analyst must perform the Training Data Identification, Course Requirements Analysis, and Course Cost and Resources Determination phases. The other three phases are optional and should be conducted in accordance with the HCM Analysis Plan.

The TRRA generates information that can feed the System Training Plan (STRAP), Qualitative and Quantitative Personnel Requirements Information (QQPRI), System MANPRINT Management Plan (SMMP), training device requirements documents, Individual Training Strategy (ITS), and Cost and Training Effectiveness Analysis (CTEA).

The following assumptions and constraints apply to the TRRA:

- Unlike Instructional Systems Development (ISD), the TRRA is not designed to generate detailed training products such as programs of instruction, media specifications, or extension training materials. The analyst estimates the requirements for these products. These estimates can then be used as an entry point to fully defining these products.
- The analyst estimates the resources and costs associated with courses of instruction conducted at formal schools and training centers. The analyst does not estimate training resources and costs for unit and collective training programs. The analyst can estimate extension training products required to support unit training.
- The analyst estimates training resources and costs for the "steady- state" or average-value year. The steady-state year is defined as the first year in which the Army training system is producing only replacement training. That is, all systems have been deployed, and training is focused on filling manpower positions vacated through attrition, migration, and promotion.

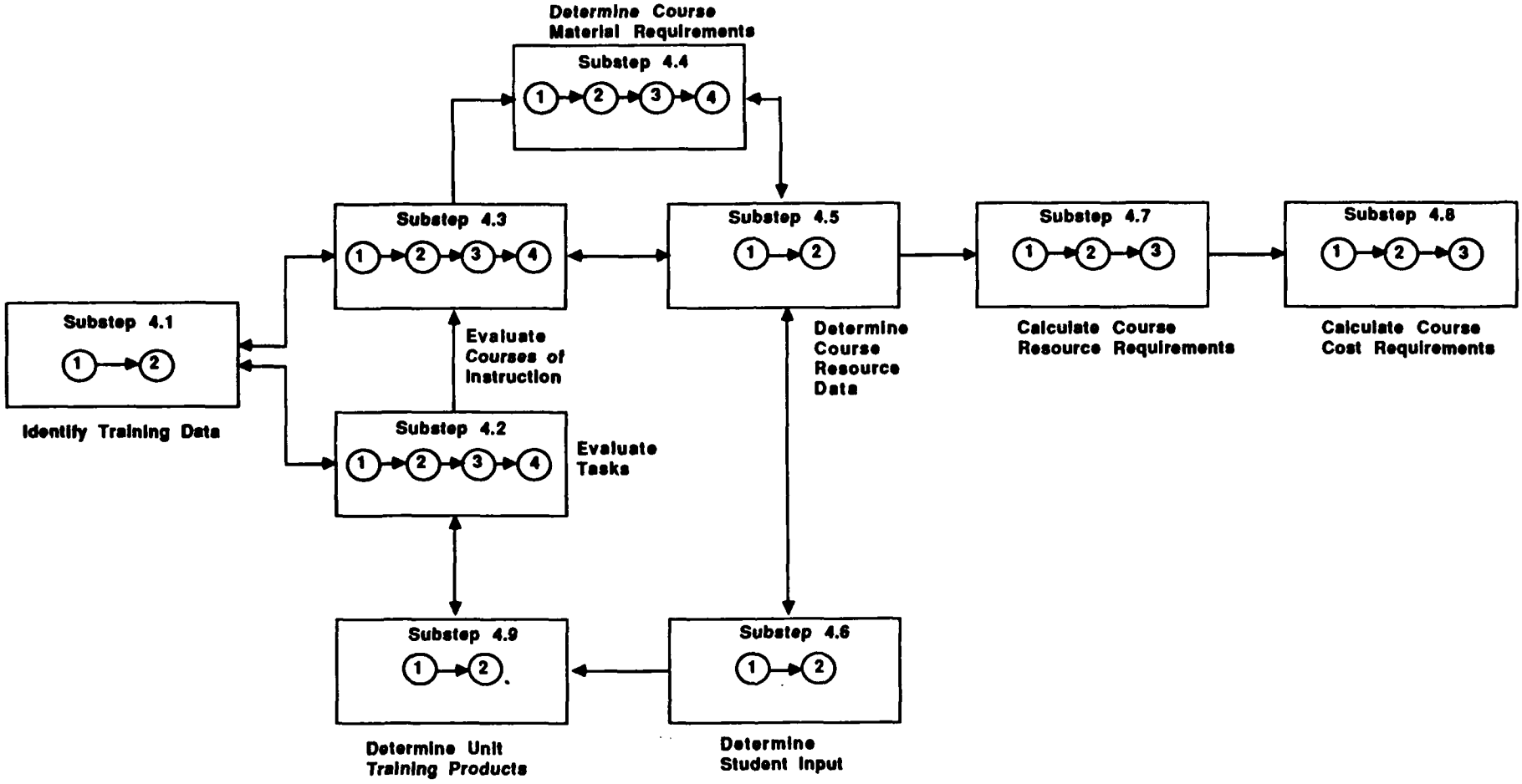


Figure 4-1. Overview of Step 4, Training Resource Requirements Analysis.

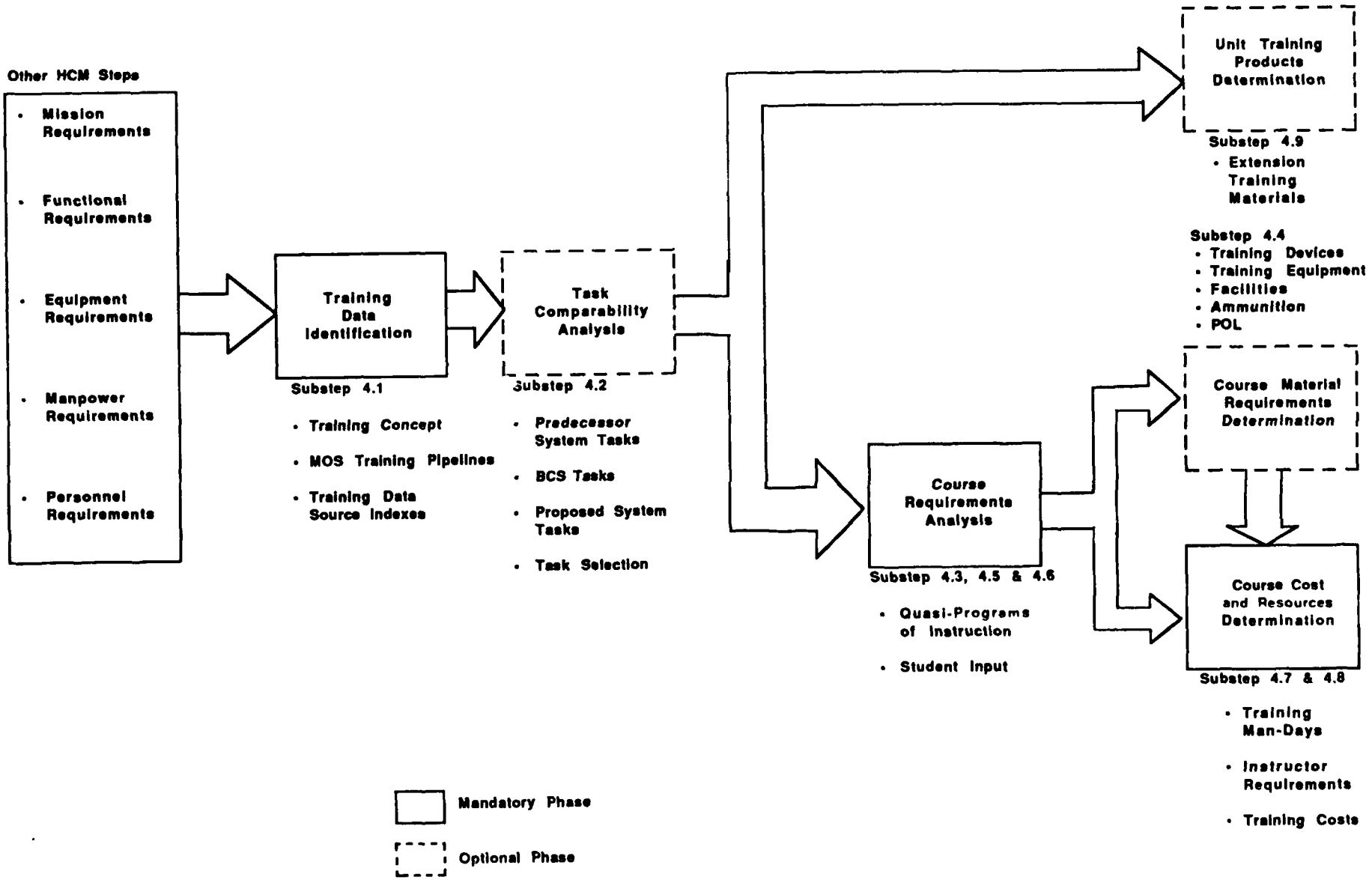


Figure 4-2. Training Resource Requirements Analysis phases.

- The analyst does not estimate the training associated with the New System's test and evaluation, transition to the field, and new equipment training (NET). However, the analyst can compare the New System's courses with the Predecessor System's courses to determine these requirements.
- The analyst must assume in the initial application of the TRRA that existing courses meet stated performance standards and the training task analysis and methods/media selection are valid.
- The analyst estimates training cost and resources for enlisted operators and maintainers. The level of supervision and technical capability incorporated for noncommissioned officers typically extends through Skill Level 3. The analyst does not determine requirements for warrant and commissioned officers. However, he or she can determine quasi-programs of instruction.

Substep 4.1: Identify Training Data

Overview

In this substep the analyst organizes and focuses the training resource requirements analysis by developing training data source indexes and documenting the New System's training concept. Figure 4.1-1 is an overview of this substep.

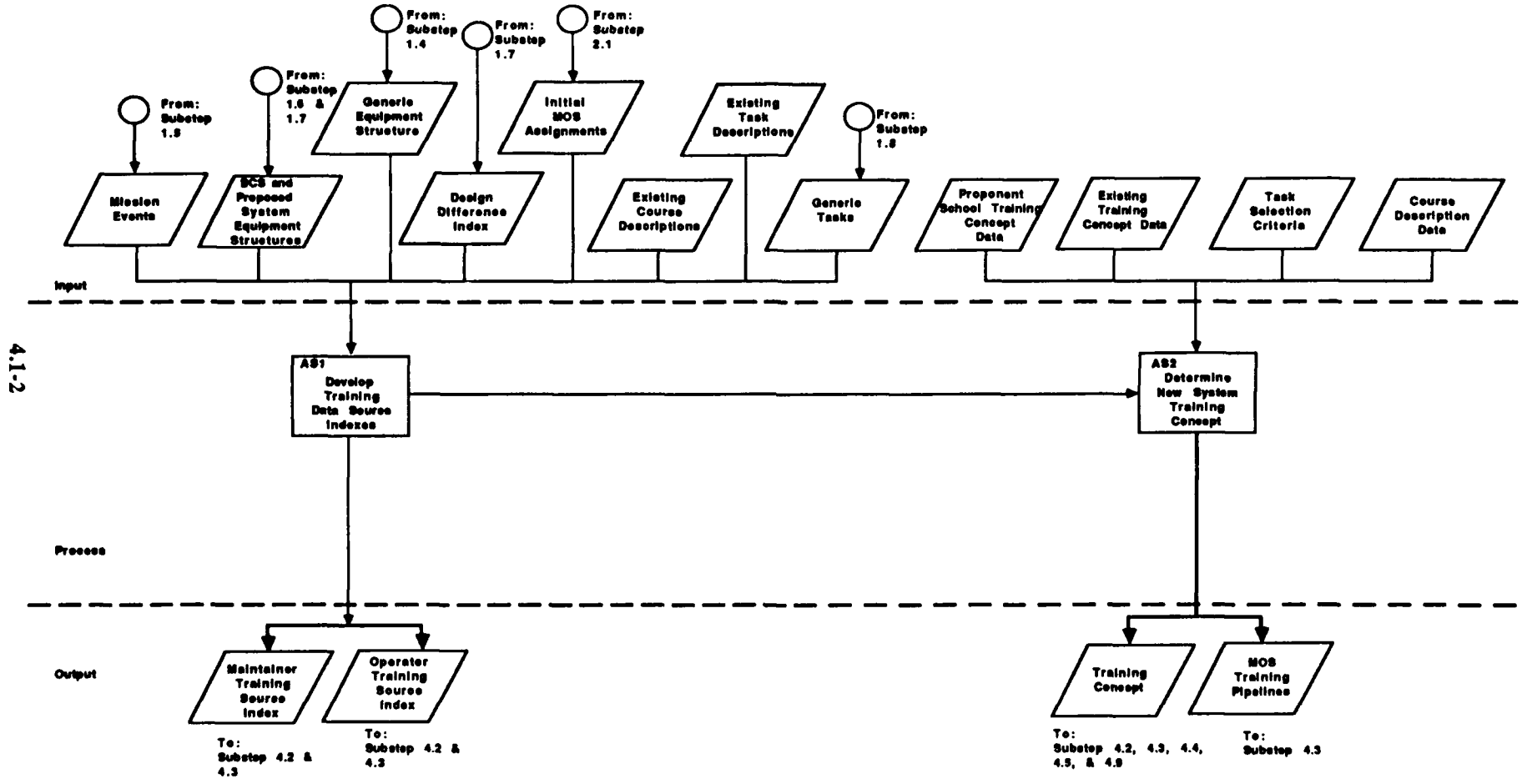
The analyst uses the data source indexes to evaluate the New System's function and equipment requirements. This evaluation identifies the training requirements (e.g., courses of instruction, course modules, and tasks) necessary to support the New System.

The analyst must develop an operator and a maintainer training data source index. The analyst develops the operator training data source index using the New System's functions and generic, BCS, and Proposed System equipment lists. The analyst focuses only on the equipment while developing the maintainer training data source index. Both indexes contain the same information with the exception of maintenance levels, which the maintainer index requires.

In addition to developing the training data source indexes, the analyst documents the New System's training concept. The training concept describes new training technologies that are to be employed and what importance will be placed on training location decisions (e.g., institutional training versus unit training). These conceptual decisions, coupled with detailed system design and resource parameters, allow the analyst to determine the New System's tasks and courses of instruction.

NOTE

The analyst should not implement the New System's training concept during the first iteration of the methodology. The analyst limits the analysis to the institutional training strategy currently in use. Establishing the baseline will enable the analyst to compare alternative training strategies.



4.1-2

Figure 4.1-1. Overview of Substep 4.1, Identify Training Data.

Action Step 1: Develop Training Data Source Indexes

Discussion

In this action step the analyst develops operator and maintainer training data source indexes for the BCS and Proposed System configurations. These indexes are a means of focusing the analysis and identifying data requirements.

For the operator index, the analyst obtains the functions identified in Substep 1.3 and the generic, BCS, and Proposed System equipment lists identified in Substeps 1.4, 1.6, and 1.7. The analyst completes an index for each function allocated to human or human and hardware/software.

For the maintainer index, the analyst uses the generic, BCS, and Proposed System equipment lists. The analyst uses the BCS equipment list for the BCS index and the Proposed System equipment list for the Proposed System index.

The analyst also determines whether the piece of equipment the engineering analyst selected for the BCS or Proposed System is suitable for the training analysis. If the equipment does not have the necessary data, the analyst must apply the equipment selection procedures described in Substep 1.6 to determine another piece of equipment appropriate for training estimation purposes.

Procedures

1. **Develop the Operator Training Data Source Index.**
   - Obtain the New System's functions and their allocations from Substep 1.3, Action Step 4. Record on Worksheet 4.1-1 the functions allocated to human or human and hardware/software.
   - Obtain the generic, BCS, and Proposed System equipment lists from Substeps 1.4, 1.6, and 1.7. For each function allocated to human and hardware, identify a BCS and Proposed System piece of equipment. Enter the function and equipment on Worksheet 4.1-1.

- Identify the Army MOS, Air Force Specialty Code (AFSC), Navy Rating, or Marine Corps MOS that currently operates the piece of equipment or performs the operator function. Use the generic tasks identified in Substep 1.8 to aid in identifying the occupational specialties that typically perform the functions.
- For the equipment-allocated functions, determine the availability of the occupational specialty's task data (e.g., Soldier's Manual, Trainer's Guide, etc.) and course materials (e.g., programs of instructions, etc.).
- If this information is not available, use the equipment selection criteria in Substep 1.6 to determine a different component for use in training estimation. Record the equipment selected on Worksheet 4.1-1.
- Obtain the skill levels from the HCM Analysis Plan and enter them on the worksheet.
- Record the following training information for each function and/or component:
  - MOS/ASI
  - Source of task information
  - Task numbers
  - Training location of each task
  - Program of instruction number
  - Annex/file number

NOTE

The analyst does not modify this information to reflect the New System's MOSs, tasks, or programs of instruction. In Substeps 4.2 and 4.3 the analyst will develop the New System's tasks and course modules based on the data recorded in these indexes.

- Obtain the training task and course materials identified on the indexes.

2. **Develop the Maintainer Training Data Source Index.**

   - Obtain the generic, BCS, and Proposed System equipment lists from Substeps 1.4, 1.6, and 1.7. Record the BCS and Proposed System equipment on Worksheet 4.1-2.
   - Obtain the maintenance levels from the HCM Analysis Plan and enter them on the worksheet.
   - Complete the remainder of the index in the same way as the operator index.

Procedure 1 Example

The analyst develops an operator training data source index as shown in Figure 4.1-2. The analyst obtains the New System functions allocated to human performance from Substep 1.3. For the function "Operate Mission Equipment", the analyst identifies the ECM set as the generic equipment (Substep 1.4) and the AN/ALQ-151(V)2 as the BCS equipment (Substep 1.6). The analyst then determines that the operator MOS for this piece of equipment is 98G. The analyst obtains the Trainer's Guides, Soldier's Manuals, and programs of instruction (POI) for this MOS. However, the analyst does not find any tasks or instruction for this piece of equipment. The analyst, in conjunction with the engineering analyst, applies the equipment selection criteria in Substep 1.6 and selects the AN/GLQ-3B as the representative equipment for training estimation. Because the operator of this piece of equipment is MOS 98G ASI K3, the analyst obtains soldier training publication 34-98G12-TG and program of instruction 231-ASIK3. Using the Trainer's Guide, the analyst identifies the skill level, MOS/ASI, task number, and training location. Using the POI, the analyst identifies the annex/file number.

Procedure 2 Example

The analyst develops a maintainer training data source index as shown in Figure 4.1-3. The analyst obtains the generic and BCS equipment lists from Substeps 1.4 and 1.6. For BCS equipment AN/ALQ-151(V)2, the analyst identifies the direct support/general support (DS/GS) maintainer MOS to be 33R. The analyst obtains STP 34-33R12-TG and POI 102-33R10. The analyst does not find tasks or instruction in these documents. The analyst applies the equipment selection criteria in Substep 1.6 and selects the AN/TSQ-114 as the representative equipment for training estimation. The maintainer for this piece of equipment is MOS 33T. The analyst obtains STP 34-33T12-TG and POI 231-F50. Using the Trainer's Guide, the analyst determines the skill level, MOS/ASI, task number, and training location. Using the POI, the analyst identifies the annex/file number.

WORKSHEET 4.1-1

Use this worksheet to document the operator training data source index.

Configuration: BCS **Function:** Operate Mission Equipment

Generic Equipment: ECM Set **Configuration Equipment:** AN/ALQ-151 (V) 2

Representative Equipment for Training Estimation: AN/GLQ-3B

SKILL LEVEL	MOS/ASI	SOURCE OF TASK INFORMATION	TASK NUMBER	TRAINING LOCATION	POI NUMBER	ANNEX/FILE NUMBER
10	98G/K3	STP 34-98G12TG	867-806-1305	Other	231-ASIK3	D/K527

Figure 4.1-2. Example of an operator training data source index.

WORKSHEET 4.1-2

Use this worksheet to document the maintainer training data source index.

Configuration: BCS

Generic Equipment: ECM Set **Configuration Equipment:** AN/ALQ-151(V) 2

Representative Equipment for Training Estimation: AN/TSQ-114

MAINTENANCE LEVEL	SKILL LEVEL	MOS/ASI	SOURCE OF TASK INFORMATION	TASK NUMBER	TRAINING LOCATION	POI NUMBER	ANNEX/FILE NUMBER
DS/GS	10	33R	STP 34-33T12-TG	867-791-2539	Other	231-F50	C/N028
				867-791-3701	Other	231-F50	C/N028

Figure 4.1-3. Example of a maintainer training data source index.

Action Step 2: Determine New System Training Concept

Discussion

In this action step, the analyst documents the New System's training concept. The System Training Plan (STRAP), described in TRADOC Reg 351-9, is a major input to the training concept. If a STRAP exists for the New System, much of the information required by this action step will be readily available.

The analyst documents the elements of the New System's training concept required by the HCM training analysis. The New System's training concept describes the training of the operators and maintainers of the system. It includes institutional and unit training strategies, training device strategies, and equipment strategies.

The New System training concept is an extension of the HCM scoping and tailoring procedures. Many of the training concept's elements significantly effect the TRRA's scope. The analyst should document only pertinent parts of the New System's training concept.

NOTE

If the training concept is incomplete or unavailable, the analyst must develop a hypothetical New System training concept.

The analyst must work closely with the Technical Advisory Group when developing, modifying, or documenting the training concept. The New System training concept should be viewed as the Army's plan for providing training support for the New System. The HCM training analysis can measure the resource requirements of the training concept. An HCM Tradeoff Analysis can be used to identify and evaluate alternative training concepts.

Procedures

1. **Collect Data.**

   - Contact the proponent school's New System Training Office (NSTO) or the TRADOC System Manager (TSM). Obtain the STRAP, O&O Plan, and any other documents describing the New System's training concept.

- Obtain from the HCM Analysis Plan the summary of courses and any other training information used for determining the TRRA's scope.

2. **Use the following outline to document the New System's Training Concept.**

   1.0 Training Concept

   1.1 General Description

   - Explain in narrative form the plan found in STRAP paragraph 2 for training personnel to operate, maintain, and manage the system. This paragraph should provide the philosophy and rationale for the proposed training concept.

   1.2 Training Constraints

   - Describe in narrative form the training constraints identified in the System MANPRINT Management Plan (SMMP) and documented in STRAP paragraph 3.

   1.3 Significant Training Issues at Risk

   - Describe in narrative form the significant training issues at risk which are documented in STRAP paragraph 7. These issues include vital training issues that must be resolved prior to system development or fielding.

   2.0 Institutional Training Strategy

   2.1 MOS Training Pipelines

   - Obtain the initial New System MOS/ASI assignments from Substep 2.1 and the HCM Analysis Plan.

   - Consult the sources listed in Table 4.1-1 and the courses identified in the HCM Analysis Plan to determine the courses of instruction that will be effected by the New System.

   - Develop MOS training pipelines for each New System MOS as shown in Figure 4.1-4.

   - For each pipeline, identify those courses that are part of the HCM analysis and those courses that are outside of the HCM's scope. Typically, only technical

Table 4.1-1. Sources for Identifying Army Courses of Instruction

Rating 1	New System Training Office (NSTO)
Rating 2	Army Training Requirements and Resources System (ATRRS)
Rating 3	AR 611-201, *Enlisted Career Management Fields and Military Occupational Specialties*

NOTE

Only Additional Skill Identifier (ASI) courses are indicated in AR 611-201.

Rating 4	DA Pam 351-4 (Formal Schools Catalog)

NOTE

These sources are rank-ordered in terms of their currentness and usefulness in identifying courses. When conflicts occur between sources, use the source with the highest rating.

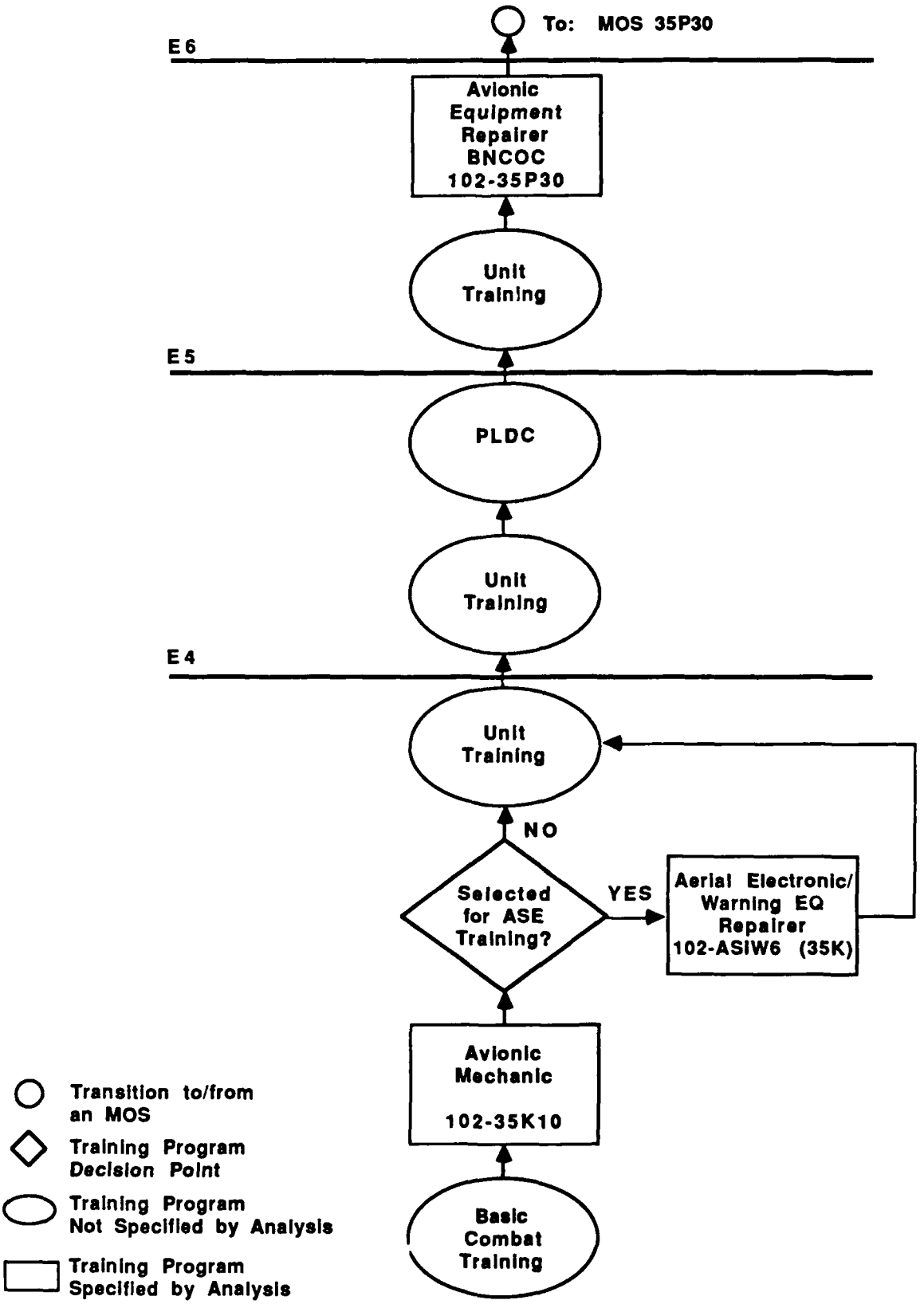


Figure 4.1-4. Sample MOS training pipeline.

courses of instruction fall within the HCM's scope. Common leadership and noncommissioned officer courses such as the Primary Leadership Development Course (PLDC) are not included. These courses are rarely affected by the introduction of a new weapon system.

- Identify courses up to the highest skill level required in the HCM Analysis Plan.

NOTE

At this point in the HCM analysis, the highest skill levels each operator and maintainer requires may not have been determined. The analyst should identify existing courses of instruction for the maximum skill level requirement. The analyst can thus ensure that programs of instruction and other training resource data can be requested and received in time for later analysis.

- If a new course is required, use the following guidelines to create a new course number. Most enlisted courses of instruction are numbered in the following manner:

101	-	29E	10
TRADOC Assigned Number		MOS	Skill Level

- Use Xs in place of any unknown elements.
- Reconcile with the NSTO all course differences between those identified in New System documents and those identified using the HCM. Some differences will occur because the NSTO may identify only system-specific courses while overlooking the non-system-specific courses.

NOTE

Support MOSs, (e.g., COMSEC Repairer, Generator Repairer, etc.), are often overlooked in training concept planning. Courses not affected by system design changes occur often in an HCM training analysis. Often, changes in student input due to force structure changes will affect these courses.

2.2 Course Descriptions

- Add each course of instruction within the analysis scope to Worksheet 4.1-3. For each configuration's MOSs, complete one worksheet.
- Complete as many course data elements as possible using the course summaries, the sources listed in Table 4.1-1, New System training concept documents, and the STRAP. The analyst can use subsequent HCM procedures to estimate the ASVAB prerequisite, modal grade, TRAMEA course type, course attrition rate, and optimum class size. The analyst uses these procedures to estimate data elements for new courses, non-Army courses, or Army courses with missing data.
- Indicate on Worksheet 4.1-3 the data elements to be determined using HCM procedures with the abbreviation "HCM". Review all course data elements with the TAG.
- For each existing course obtain the most recent program of instruction (POI). POIs are available from the Directorate of Training and Doctrine (DOTD) at the MOS's proponent school. Along with the POI, request TRADOC Form 377-R (ICH Computation Worksheet). In obtaining POIs for a non-Army course, it may be necessary to contact the other service's school. Use the following sources to obtain the description and location of each non-Army course:
  - United States Air Force - Air Force Manual (AFM) 50-5 USAF Formal School Catalog
  - United States Marine Corps - Marine Corps Order (MCO) P1500.12K Marine Corps Formal School Catalog
  - United States Navy - NAVEDTRA 10500 Catalog of Navy Training Courses (CANTRAC)

3.0 Unit Training Strategy

3.1 Individual Training

- Describe in narrative form the training strategy for individual unit training documented in STRAP paragraph 2 and Annex B. Include descriptions of individual sustainment training that the soldier requires to maintain

performance standards. List the types of training products required to sustain individual skills and how they will be issued and used in the unit.

3.2 Collective Training

- Describe in narrative form the training strategy for collective unit training documented in STRAP paragraph 2 and Annex B. Include descriptions of collective training that the crew or unit requires to train doctrine and tactics. For example, exercises, simulations, embedded training, crew drills, etc. through which the crew/unit learns to employ the system. List the types of training products required to support collective training and how they will be issued and used in the unit.

4.0 Training Device/Equipment Strategy

- Describe in narrative form the training device and training equipment strategy to be employed. The training device strategy is located in STRAP paragraph 5. Describe in detail the training devices and training equipment to be employed including the device/equipment numbers and names; how they are to be issued and used in both individual and unit training; student to device/equipment ratios and student to instructor ratios; and what training device analysis was performed to verify the requirement.

NOTE

Detailed descriptions of these training device/equipment requirements are necessary if Substep 4.4, Determine Course Material Requirements, is to be performed.

SUBSTEP 4.1
WORKSHEETS

WORKSHEET 4.1-1

Use this worksheet to document the operator training data source index.

Configuration: _____ **Function:** _____

Generic Equipment: _____ **Configuration Equipment:** _____

Representative Equipment for Training Estimation: _____

SKILL LEVEL	MOS/ASI	SOURCE OF TASK INFORMATION	TASKS	TRAINING LOCATION	POI NUMBER	ANNEX/FILE NUMBER

WORKSHEET 4.1-2

Use this worksheet to document the maintainer training data source index.

Configuration: _____

Generic Equipment: _____ **Configuration Equipment:** _____

Representative Equipment for Training Estimation: _____

MAINTENANCE LEVEL	SKILL LEVEL	MOS/ASI	SOURCE OF TASK INFORMATION	TASKS	TRAINING LOCATION	POI NUMBER	ANNEX/FILE NUMBER

WORKSHEET 4.1-3

Use this worksheet to document the course summary.

CONFIGURATION: **MOS:**

COURSE DATA ELEMENT	COURSES OF INSTRUCTION					
	COURSE #1	COURSE #2	COURSE #3	COURSE #4	COURSE #5	COURSE #6
Course Number						
ASI/SQI						
Skill Level						
Maintenance Level						
Proponent						
Training Location						
Course Security Clearance						
ASVAB Prerequisite						
Student Input (SI)	TO BE DETERMINED BY HCM					
Course Length (NCL) - In Days	TO BE DETERMINED BY HCM					
One Time Instructor Contact Hours (ICH)	TO BE DETERMINED BY HCM					
Modal Grade						
TRAMEA Course Type						
Course Attrition Rate (CAR)						
Optimum Class Size (OCS)						

☐ *Required for subsequent training cost and resource calculations. If unknown, determine using HCM procedures.*

Substep 4.2: Evaluate Tasks

Overview

In this substep the analyst identifies training tasks for the Predecessor System, Baseline Comparison System (BCS), and Proposed System. The analyst uses comparability analysis to identify existing tasks for comparative purposes. Existing comparable tasks provide data that the analyst can use to estimate skill levels, training products, training settings, course requirements, aptitude requirements, etc., for the New System. Figure 4.2-1 is an overview of this substep.

The training data source indexes developed in Substep 4.1 provide a mission- and equipment-based focus to the task analysis. This focus ensures that all training materials incorporated in the analysis results are actually needed to fulfill the system's operator and maintainer requirements.

The analyst evaluates each Predecessor System, BCS, and Proposed System task on a series of worksheets. The analyst then assigns the Proposed System's tasks to training settings.

To conduct the analysis the analyst must collect a wide array of data specific to the system and/or configuration. Many of these data are generated by other HCM substeps. For example, the mission events, functions, and equipment configurations from Step 1 become the focus of the task analysis.

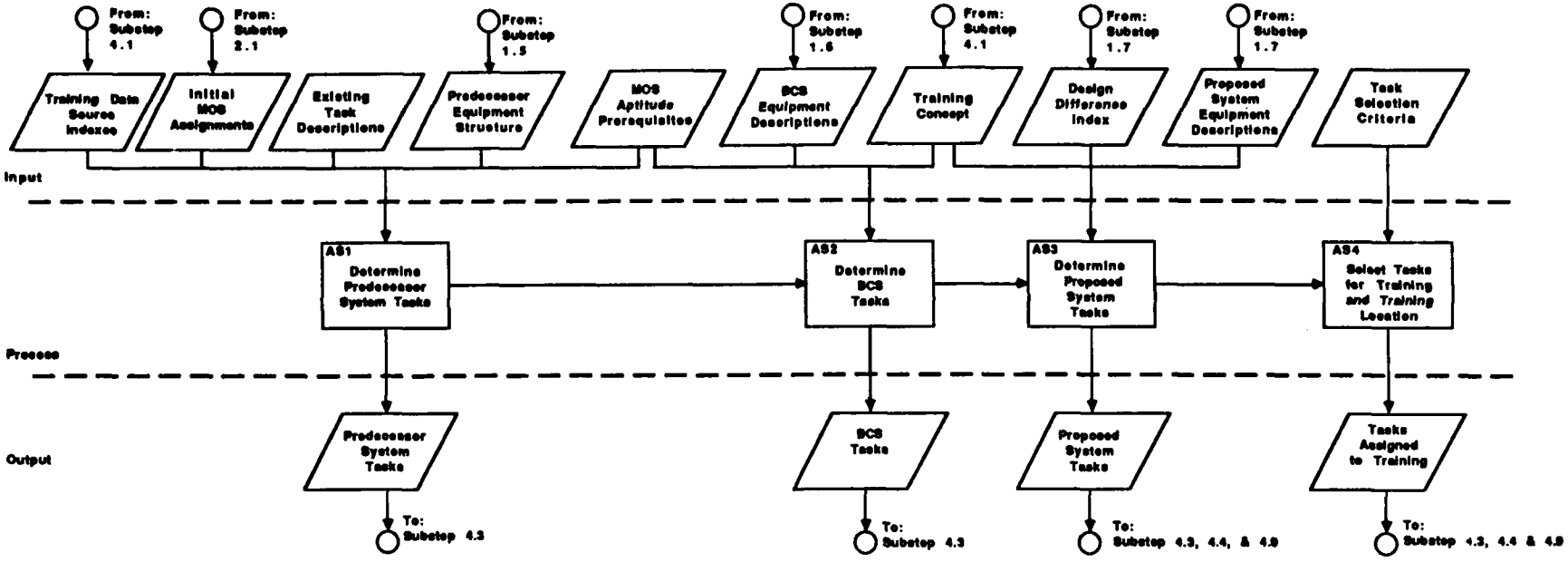


Figure 4.2-1. Overview of Substep 4.2, Evaluate Tasks.

Action Step 1: Determine Predecessor System Tasks

Discussion

The analyst's objective in this action step is to identify and document the Predecessor System's tasks. If the New System does not have a Predecessor System, the analyst does not perform this action step.

Typically, the analyst obtains the largest portion of BCS training data from the Predecessor System's operator and maintainer training. Beginning the training analysis with the Predecessor System tasks provides a means of identifying large numbers of tasks. These tasks provide insight to the New System's operation and maintenance requirements. Additionally, through analysis of the Predecessor System's Soldier Training Publications (STPs), the analyst gains a greater understanding of existing MOS training plans and overall training concepts employed by the proponent schools.

In this action step the analyst also identifies existing Predecessor System training products that he or she will use to estimate unit training product requirements in Substep 4.9.

Procedures

1. **Identify the Predecessor System's Tasks.**

   - For the Predecessor System, obtain the summary of maintainer MOS/ASI assignments by equipment from Worksheet 2.1-2 and the summary of operator MOSs/ASIs from Worksheet 2.1-1.
   - For each Predecessor System MOS, obtain the Trainer's Guide and the Soldier's Manual for all skill levels included in the analysis scope.
   - Determine which tasks listed in the Trainer's Guide pertain to the Predecessor System. Predecessor System tasks are usually easy to identify because the Predecessor System's name or nomenclature is included in the task title.
   - If the Predecessor System is not readily apparent for some tasks, consult the following sources to determine whether the task is performed on the Predecessor System:

- The detailed description of the task in the Soldier's Manual
- The program of instruction in which the task is taught
- Technical Manuals and other documents referenced by the task
- Subject-matter experts (SMEs) at the proponent school

2. **Document the Predecessor System's Tasks.**

- Using the Trainer's Guide and Soldier's Manual, enter the following information on Worksheet 4.2-1:
  - Task Type - enter P for Predecessor System
  - MOS/ASI
  - Skill Level
  - Task Number
  - Soldier Training Publications
  - Task Title
  - Subject Area
  - References
  - Duty Position - the duty position assigned responsibility for the performance of the task on the Predecessor System. AR 611-201 is another source of this information.
  - Equipment Numbers - these are the Predecessor System equipment numbers. Obtain these numbers from Substep 1.2. Multiple equipment numbers are possible.
  - Training Devices - training devices used to support the training of the task. Programs of instruction are another source of this information.
  - Training Location
  - Sustainment Training Frequency
  - Sustainment Training Skill Level
  - Drill/ARTEP Number

Procedure 1 and 2 Examples

The AN/VRC-47 radio is the Predecessor System to a new radio. The analyst obtains the MOS/ASI list from Substep 2.1. MOS 29E is the direct support maintainer.

The analyst obtains the 29E's Trainer's Guide and reviews the tasks. Many different receiver-transmitters, amplifiers, control groups, etc., are identified in the task titles, but no references are made to the AN/VRC-47 radio. References at the end of the Trainer's Guide indicate that receiver-transmitters transmitters RT-524 and RT-246, receiver R-442/VRC, and RT-524/RT-246/VRC are components of the VRC-12 series of radios. The AN/VRC-47 radio is one configuration of these components.

In the operator's Technical Manual for the AN/VRC-47, the RT-524/VRC is listed as the receiver-transmitter. The analyst documents each task as shown in Figure 4.2-2.

WORKSHEET 4.2-1

Use this worksheet to document task information from the Predecessor System and other existing systems.

Task Type: P

MOS/ASI: 29E **Skill Level:** 10 **Task Number:** 113-587-8026 **Soldier Training Publications:** STP 11-29E34-SM-TG

Task Title: Align the A6300 and A6400 in RT-524/VRC (or RT-246/VRC)

Subject Area: Receiver(s) / Transmitter(s)

References: TB 11-5820-401-34-1

Equipment Numbers: 6809

Duty Position: C-E Radio Repairer

Training Devices: None

TRAINING LOCATION				Sustainment Training Frequency:	Drill/ARTEP Number:
				Annually	
BT: AIT: X OSUT:	PLDC: PTC: BNC:	BTC: ANC: SNC:	SGMA: UNIT: OTHER:	Sustainment Training Skill Level: 1-3	None

Figure 4.2-2. Example of a Predecessor System task.

Action Step 2: Determine BCS Tasks

Discussion

In this action step the analyst evaluates the Predecessor System tasks and determines which tasks should be included in the BCS. The analyst identifies other existing tasks as comparable tasks for BCS equipment components that are not from the Predecessor System. The analyst then documents each BCS task.

The analyst determines BCS tasks using this action step and Substep 4.1. The training data source indexes from Substep 4.1 provide the BCS equipment configuration and functional requirements, which serve as the focus of this evaluation process. The analyst updates the training data source indexes to include those Predecessor and comparable tasks that he or she has selected for the BCS.

Procedures

1. **Evaluate Predecessor System Tasks for the BCS.**
   - Obtain the Predecessor System tasks from Worksheet 4.2-1.
   - If there is no Predecessor System, skip to Procedure 2.
   - For maintenance tasks, use the equipment identified on the maintainer training data source index to determine which Predecessor System equipment is included in the BCS. If a Predecessor System component is part of the BCS equipment configuration, enter the component's associated tasks on Worksheet 4.2-2.
   - For operator tasks, use the functional requirements and equipment identified on the operator training data source index to determine which Predecessor System tasks are part of the BCS.
   - If necessary, update the training data source indexes.
   - Complete Worksheet 4.2-2, leaving duty position and equipment numbers blank.

NOTE

The analyst should not modify the Predecessor System task elements that are used for the BCS. The BCS should reflect current training practices, not practices that are proposed for the New System.

- Use the task evaluation codes listed in Table 4.2-1 to assess each BCS task. Record the evaluation code on Worksheet 4.2-2.

2. **Evaluate Comparable Tasks for the BCS.**

   - Use the training data source indexes to identify the BCS components that are not part of the Predecessor System.
   - If the index contains the tasks for these other BCS components, record these "comparable" tasks on Worksheet 4.2-1. Enter "C" for the task type.
   - If the index does not contain the tasks for the other BCS components, identify the tasks associated with the component and record them on Worksheet 4.2-1. Update the training data source indexes.
   - Use the comparable task to create a BCS task on Worksheet 4.2-2. Complete the BCS task description as follows:
     - Task Number - Ten-character code in the form XXX-XXX-XXXX

       If necessary, create new task numbers in the following manner:

       (1) The first three numbers identify the task proponent's training activity code, as found in TRADOC Reg 351-11.

       (2) The next three characters indicate the MOS that will be assigned the task, e.g., 29E.

       (3) The last four-digit numeric code contains the skill level in the first position, and the remaining three positions allow a maximum of 999 tasks per skill level.

     - MOS/ASI - The MOS/ASI that will perform the task
     - Skill Level - Use the comparable task's skill level
     - Task Title - Change the title to reflect the New System and its equipment
     - Subject Area - Leave blank
     - References - Use the comparable task's references

Table 4.2-1. Task Evaluation Codes

1. Task Modification Codes

   NC - No change in task.

   MIN - Minor task modification – Task essentially the same. Only minor change in equipment/procedure required.

   SKI - Skill level change – Task essentially the same but assigned to different skill level.

   FRE - Frequency change – Same task but task is performed more (or less) frequently due to change in reliability, operational tempo, etc. Tasks with the FRE code are further qualified by an additional code, e.g., FRE-R.

      R - Change in reliability

      M - Change in maintenance concept/doctrine

      O - Change in operational concept/doctrine

      D - Degraded operational mode

   MAJ - Major task modification – Significant change in skill and knowledge requirements, task procedures, and/or other task characteristics. Tasks with the MAJ code are further qualified by an additional code, e.g., MAJ-D.

      D - Change in design

      A - Automation

      O - Change in operational concept/doctrine

      M - Change in maintenance concept/doctrine

2. Task Deletion Codes

   ELI - Elimination of subsystem

   AUT - Task automation - Task now performed by equipment/software

   RTF - Reduced task frequency

   MC - Change in maintenance concept/doctrine

   OC - Change in operational concept/doctrine

   SUB - Substitution of subsystem

- Duty Position - Leave blank
- Equipment Numbers - Leave blank
- Training Devices - Use the comparable task's training devices
- Training Location - Use the comparable task's training location
- Sustainment Training Frequency - Use the comparable task's sustainment training frequency
- Sustainment Training Skill Level - Use the comparable task's sustainment training skill level
- Drill/ARTEP Number - Use the comparable task's drill/ ARTEP number

- Use the task evaluation codes on Table 4.2-1 to assess each comparable task and enter a code on Worksheet 4.2-2.

NOTE

Evaluating comparable tasks is more difficult than evaluating Predecessor System tasks. Comparable tasks may be derived from weapon systems and proponent schools that are not associated with the New System. Hence, the analyst has to perform more analysis and consult subject-matter experts.

3. **Complete the BCS Task Descriptions.**

- Use the Trainer's Guides for the Predecessor System's MOSs to develop logical and consistent subject areas.
- Reconcile the identification and assignment of duty positions to the BCS. This reconciliation requires interaction with the manpower analyst and involves a comparison of workload tasks to training tasks. This process is part of the MOS selection procedures described in Substeps 2.3 and 2.4.
- Based on the results of this reconciliation, identify one or more duty positions for each task. Record these duty positions on Worksheet 4.2-2.

NOTE

If the skill level of the duty position does not coincide with the skill level of a task, do not change the task's skill level. This information can be used later to study the complexity and span of control of the duty positions.

- Obtain the BCS equipment list from Substep 4.1 and identify each BCS component associated with each task. Record one or more of the BCS equipment identification codes on Worksheet 4.2-2.

Procedure 1, 2, and 3 Examples

The analyst obtains the BCS maintainer training data source index from Substep 4.1. For the Forward Looking Infrared Radar (FLIR) system, the AN/ALQ-144 from the Predecessor System has been selected as the representative equipment for training estimation. For the aviation unit maintenance (AVUM) level, MOS 35K has been identified. Task number 113-586-0162 has been identified from STP 11-35K12-SM-TG, with a training location of "AIT." The analyst obtains this Soldier Training Publication (STP) and, using the information located in the Trainer's Guide section, completes Worksheet 4.2-2 except for duty position, equipment numbers, and training devices.

The training analyst and the manpower analyst reconcile any differences between their analyses. The analyst records the duty position "Avionic Mechanic" on Worksheet 4.2-2.

The analyst obtains the BCS equipment list from Substep 4.1 and identifies the equipment identification code for the FLIR as "89900E." The analyst then obtains the POI for the 102-ASIW6 (35K) course. Using the training aids, device, and substitute summary in the appendix, the analyst selects the "mock-up AN/ALQ-144" for use in this course. The analyst adds this training device to Worksheet 4.2-2.

The New System's FLIR system will be very similar to the AN/ALQ-144. The analyst determines that there are only minor procedural differences from the existing task. The analyst enters task modification code "MIN" on Worksheet 4.2-2. Figure 4.2-3 shows an example of the completed BCS task evaluation.

WORKSHEET 4.2-2

Use this worksheet to document BCS task information.

Task Type: B

MOS/ASI: 35K **Skill Level:** 10 **Task Number:** 113-586-0162 **Soldier Training Publications:** STP 11-35K12-SM-TG

Task Title: Troubleshoot the FLIR system

Subject Area: Aircraft Radar and Special Equipment Systems Maintenance

References: TM 11-5865-200-12, TM 11-5865-34-2, TM 11-5865-200-20P, TM 11-5865-34-P, TM 11-5865-34-1

Equipment Numbers: 89900E

Training Devices: Mock-Up AN/ALQ-144

Duty Position: Avionic Mechanic

TRAINING LOCATION				Sustainment Training Frequency: SA Sustainment Training Skill Level: 1-2	Task Modification Code MN
BT: AIT: OSUT:	PLDC: PTC: BNC:	BTC: ANC: SNC:	SGMA: UNIT: OTHER: X	Drill/ARTEP Number: None	Task Deletion Code

Figure 4.2-3. Example of a BCS task evaluation.

Action Step 3: Determine Proposed System Tasks

Discussion

In this action step the analyst evaluates each BCS task. The analyst accomplishes this evaluation using task modification codes that result in the inclusion, further evaluation, or deletion of the BCS tasks.

The analyst uses applicable BCS tasks and additional new tasks to develop a Proposed System task list. Each Proposed System task is described, including duty positions, equipment, training materials, and training devices.

The analyst studies the operator and maintainer requirements of each Proposed System and evaluates the impact of these requirements on each of the BCS tasks. In making this evaluation, the analyst uses sources that describe the performance requirements of both the BCS task and the Proposed System task. These sources include mission events, generic tasks, Trainer's Guides, Soldier's Manuals, Technical Manuals, Field Manuals, programs of instruction, subject-matter experts (SMEs) at the proponent school, and information about the New System.

Procedures

1. **Evaluate BCS Tasks for the Proposed System.**
   - Obtain the BCS tasks from Worksheet 4.2-2.
   - Use the training data source indexes to determine which BCS equipment is included in the Proposed System. If a BCS component is part of the Proposed System equipment configuration, enter the BCS component's associated tasks on Worksheet 4.2-3.
   - If the description of the task is not detailed enough to make a proper assessment, consult one or more of the following sources:
     - The detailed description of the task in the Soldier's Manual or other task documents.
     - The program of instruction in which the task is taught.
     - Technical manuals and other documents describing equipment operation or maintenance.
     - Subject-matter experts at the proponent school.

- If necessary, update the training data source indexes.
- Complete Worksheet 4.2-3, leaving duty position, subject area, equipment numbers, training devices, and training location blank.
- Use the task evaluation codes listed in Table 4.2-1 to assess each Proposed System task. Record the evaluation code on Worksheet 4.2-3.

2. **Evaluate Comparable Tasks for the Proposed System.**

NOTE

This procedure is very similar to the BCS comparable task evaluation performed in the previous action step. The analyst performs this procedure when a Proposed System differs from the BCS.

- Use the training data source indexes to identify the Proposed System components that are not part of the BCS.
- If the index contains the tasks for these other Proposed System components, record these "comparable" tasks on Worksheet 4.2-1. Enter "C" for the task type.
- If the index does not contain the tasks for the other Proposed System components, identify the tasks associated with the component and record them on Worksheet 4.2-1. Update the training data source indexes.
- Use the comparable task to create a Proposed System task on Worksheet 4.2-3. Complete the Proposed System task description as follows:
  - Task Number - Ten-character code in the form XXX-XXX-XXXX

    New task numbers are created in the following manner:

    (1) The first three numbers identify the task proponent's training activity code as found in TRADOC Reg 351-11.

    (2) The next three characters indicate the MOS that will be assigned the task, e.g., 29E.

    (3) The last four-digit numeric code contains the skill level in the first position and the remaining three positions allow a maximum of 999 tasks per skill level.

- MOS/ASI - The MOS/ASI that will perform the task
- Skill Level - Use the comparable task's skill level
- Task Title - Change the title to reflect the New System and its equipment
- Subject Area - Leave blank
- References - Use the comparable task's references
- Duty Position - Leave blank
- Equipment Numbers - Leave blank
- Training Devices - Leave blank
- Training Location - Leave blank
- Sustainment Training Frequency - Use the comparable task's sustainment training frequency
- Sustainment Training Skill Level - Use the comparable task's sustainment training skill level
- Drill/ARTEP Number - Use the comparable task's drill/ARTEP number

• Using the task evaluation codes in Table 4.2-1, assess each comparable task and enter a code on Worksheet 4.2-3.

3. **Complete the Proposed System Task Descriptions.**

• Use the BCS task subject areas identified in Action Step 2. Create new subject areas as needed.

• If appropriate, use the BCS duty positions identified in Action Step 2. Otherwise, reconcile discrepancies or the need for new duty positions with the manpower analyst by using the MOS selection procedures in Substeps 2.3 and 2.4.

• Obtain the Proposed System equipment lists from Substep 4.1 and identify each Proposed System component associated with each task. Record one or more of the Proposed System equipment identification codes on Worksheet 4.2-3.

• Review the New System's training concept to identify training devices and training products to be developed as a part of the system. Other sources include the System Training Plan (STRAP), Operational and Organizational (O&O) Plan, and Training Device Requirements (TDRs).

- After analyzing these documents and obtaining other information from the TSM or combat developer, assign the proposed training devices to the tasks on Worksheet 4.2-3.

Procedure 1 Example

Using the Proposed System's maintainer training data source indexes, the analyst determines that the Forward Looking Infrared Radar (FLIR) system, a BCS component, will be a component in Proposed System 1, but not Proposed System 2. Using the information on Worksheet 4.2-2, STP 11-35K12-SM-TG, and Table 4.2-1, the analyst completes all fields on Worksheet 4.2-3 except subject area, duty positions, training devices, and training location. Because the FLIR system is to be included in Proposed System 1 and the task will require only minor changes in task performance, the analyst selects the "MIN" task evaluation code from Table 4.2-1. Proposed System 2 will not encompass the FLIR system. Therefore, the analyst selects the "ELI" task evaluation code from Table 4.2-1.

Procedure 2 Example

Using the Proposed System's maintainer training data source indexes, the analyst determines that the countermeasures set is peculiar to Proposed System 2 and is not included in the BCS. Countermeasures set AN/ALQ-151(V)2 is the desired piece of equipment. However, because of insufficient training data, countermeasures set AN/GLQ-3B has been selected for training estimation purposes.

MOS 98G and the tasks required to maintain the AN/GLQ-3B are indicated on the maintainer training data source index. The analyst obtains MOS 98G's STP and completes Worksheet 4.2-1 as shown in Figure 4.2-4. The analyst uses comparable task type "C" on the worksheet.

The analyst then evaluates this task for the Proposed System on Worksheet 4.2-3. The analyst completes all fields on the worksheet except subject area, duty position, equipment numbers, training devices, and training location. Because of significant differences in the procedures required to prepare the two countermeasures sets for operation, the analyst selects the "MAJ-D" task evaluation code from Table 4.2-1. The analyst forms a new task number by using the first three proponent school numbers of the old task (867), the MOS code for the MOS that will perform the task (98G), the skill level at which the task will be performed (1), and a new task sequence number (022). In this example, this task is the 22nd new task that has been determined. An example of the Procedure 2 results is shown in Figure 4.2-5. The analyst completes the remainder of the task description in Procedure 3.

WORKSHEET 4.2-1

Use this worksheet to document task information from the Predecessor System and other existing systems.

Task Type: C

MOS/ASI: 98G **Skill Level:** 10 **Task Number:** 867-806-1305 **Soldier Training Publications:** STP 34-98G12-SM-2

Task Title: Prepare Countermeasures Set AN/GLQ-3B for operation

Subject Area: Electronic Countermeasures

References: TM 11-5865-223-10

Equipment Numbers: Not Applicable

Duty Position: Electronic Countermeasures Voice Operator

Training Devices: None

TRAINING LOCATION				Sustainment Training Frequency:	Drill/ARTEP Number:
				SA	
BT:	PLDC:	BTC:	SGMA:	Sustainment Training Skill Level:	None
AIT:	PTC:	ANC:	UNIT:		
OSUT:	BNC:	SNC:	OTHER: X	1-2	

Figure 4.2-4. Example of a Proposed System comparable task.

WORKSHEET 4.2-3

Use this worksheet to document Proposed System task information.

MOS/ASI: 98G **Skill Level:** 10 **Task Number:** 867-98G-1022 **Soldier Training Publications:** STP 34-98G12-SM-2

Task Title: Prepare Countermeasures Set AN/ALQ-151(V) 2 for Operation

Subject Area:

References: TM 11-5865-223-10 **Equipment Numbers:**

Duty Position: **Training Devices:**

TRAINING LOCATION				Sustainment Training Frequency: SA Sustainment Training Skill Level: 1-2	Proposed System	Task Evaluation Code
BT: AIT: OSUT:	PLDC: PTC: BNC:	BTC: ANC: SNC:	SGMA: UNIT: OTHER:	Drill/ARTEP Number: None	Proposed 2	MAJ-D

Figure 4.2-5. Example of a Proposed System comparable task evaluation.

Procedure 3 Example

To complete the Proposed System 1 task identified in Procedure 1. the analyst obtains the New System's training concept from Substep 4.1 and reviews it as well as other pertinent New System training requirement documents. After reviewing the BCS task subject area and duty positions, the analyst determines that these entries should not change. This is because MOS 35K is an existing MOS and the Proposed System FLIR is very similar to the existing systems already maintained by this MOS. Accordingly, the analyst adds the BCS task subject area and duty positions to Worksheet 4.2-3.

The analyst obtains the Proposed System's equipment list from Substep 4.1 and forms the same BCS equipment identification code for the FLIR for Proposed System 1. The analyst adds this code to the equipment number on Worksheet 4.2-3. The completed worksheet is shown in Figure 4.2-6.

The training device strategy in the New System training concept indicates that a FLIR system mock-up will be required. The analyst adds the training device to Worksheet 4.2-3.

WORKSHEET 4.2-3

Use this worksheet to document Proposed System task information.

MOS/ASI: 35K **Skill Level:** 10 **Task Number:** 113-586-0162 **Soldier Training Publications:** STP 11-35K12-SM-TG

Task Title: Troubleshoot the FLIR system

Subject Area: Aircraft Radar and Special Equipment Systems Maintenance

References: TM 11-5865-200-12, TM 11-5865-34-2, TM 11-5865-200-20P, TM 11-5865-34P, TM 11-5865-34-1

Equipment Numbers: 89900E

Duty Position: Avionic Mechanic

Training Devices: FLIR System Mock-Up

TRAINING LOCATION				Sustainment Training Frequency: SA Sustainment Training Skill Level: 1-2	Proposed System	Task Evaluation Code
BT: AIT: OSUT:	PLDC: PTC: BNC:	BTC: ANC: SNC:	SGMA: UNIT: OTHER:	Drill/ARTEP Number: None	Proposed 1	MN

Figure 4.2-6. Example of a completed Proposed System task evaluation excluding training location.

Action Step 4: Select Tasks for Training and Training Location

Discussion

In this action step the analyst determines which tasks will be trained and their training location. Each task selected for training and its training location has significant impacts on training cost and resource requirements.

The analyst performs two task selections, one to select tasks for training and the other to select training locations. Because there is no universally applied model for selecting tasks, the procedures used to make these selections are more open-ended than others described in the HCM training analysis. Each TRADOC school can adopt and employ its own procedures, resulting in a large number of models that the training analyst may encounter.

For the train/no train selection, a comparability analysis approach is typically employed. In this approach, the analyst assumes that all tasks identified in the previous action steps have been assigned to training. The analyst makes this assumption because most of these tasks were taken from Army Trainer's Guides and Soldier's Manuals. All tasks, by their inclusion in these publications, have been determined by their proponent school to be "critical" tasks and, hence, require training. This approach can also be used for training location selection if the New System's training concept will employ training locations that are already available to the MOS.

The analyst can use a task selection model if many of the tasks were derived from non-Army sources; and the task selection model used by the proponent school is preferred, well-described, and can be employed within resource constraints. Detailed task selection allows the analyst to integrate and evaluate the New System's training task requirements with other MOS tasks. If this analysis is to be performed, detailed task selection data must be available. The decision to employ a task selection model should be made during the HCM analysis planning process.

The procedures employed in this approach are specific to the task selection model and criteria chosen and, thus, cannot be fully described here. However, each procedure contained in TRADOC Pam 351-4, *Job and Task Analysis Handbook*, is briefly summarized below. Most TRADOC schools employ one of these procedures or derive their own composite system by combining aspects of the procedures listed in TRADOC Pam 351-4.

- **Eight-Factor Model.** This model, contained in TRADOC Pam 350-30, *Interservices Procedures for Instructional System Development*, is the most data-intensive. As such, it requires a large data collection and analysis effort. It is best employed late in the acquisition process. The factors used in the model are:

  (1) Percent performing
  (2) Percent time spent performing
  (3) Consequences of inadequate performance
  (4) Task delay tolerance
  (5) Frequency of performance
  (6) Task learning difficulty
  (7) Probability of deficient performance
  (8) Immediacy of performance

- **Four-Factor Model.** This model incorporates four factors from the previous model:

  (1) Percent performing
  (2) Consequence of inadequate performance
  (3) Task delay tolerance
  (4) Task learning difficulty

  It requires less data collection and analysis but still involves a great deal of time to administer.

- **Training Emphasis Scale.** This model combines several factors into a simple, one-factor rating scale. This scale requires the supervisor to estimate whether a task requires training. The supervisor's determination is based on evaluation of the task's importance to the MOS.

- **Comprehensive Occupational Data Analysis Program (CODAP).** Traditionally, the Army Occupational Survey Program has produced a rank ordering of tasks depending on the prioritization scheme established by the CODAP. CODAP data prepared by task rank order are based on (1) percentage of soldiers performing the tasks and (2) the scale of relative time spent. These data indicate tasks that require an extensive amount of time on the job in terms of actual performance.

- **Difficulty, Importance, and Frequency (DIF) Model.** In this model, the supervisor and incumbent are asked three questions about each task:

(1) What is the difficulty of this task in terms of learning and performance?

(2) What is the relative importance of this task?

(3) How frequently is this task performed?

The sophistication and sensitivity of this technique can be increased by incorporating degrees of difficulty, importance, and frequency (DIF). Use of more detailed levels of training also makes this technique more robust.

- **Wartime/Peacetime Model.** This model resolves some of the inadequacies of the other models in terms of isolating tasks to be performed in combat. This model simply proposes that a training decision maker must know what tasks are performed in combat, since many of these tasks will never be performed in peacetime. The grouping of wartime and peacetime tasks is prepared by a committee of senior officers and noncommissioned officers familiar with the MOS, combat, and future threat.

Each of the above models is summarized in Table 4.2-2. Most of this table is taken from TRADOC Pam 351-4, *Job and Task Analysis Handbook.*

NOTE

The analyst must be careful in the task selection process. Introducing task selection criteria different from those being currently used by the proponent school or introducing new or very different training locations from what is currently available may make interpretation of analysis results difficult. As mentioned previously, the analysis should focus on the New System's design configuration and employment characteristics. Once the initial analysis results have been obtained and interpreted, alternative task selection models can be employed and alternative training locations can be further studied.

Table 4.2-2. Task Selection Models

Model	Advantages	Disadvantages	Major Attributes
8 - Factor	Very comprehensive set of factors	Data collection - difficult; Data analysis - difficult; Weighting of factors - awkward, time-consuming	Extensive data collection; data useful in design
4 - Factor	Fairly comprehensive set of factors	Data collection - difficult; Data analysis - difficult; Weighting of factors - awkward, time-consuming	More manageable than 8 - factor model
Training Emphasis Scale	1-factor rating scale, combines several factors; high correlation with 4- factor model; well-received by the field; administered to supervisors, small sample (40)	Data not collected from incumbents	Single-factor; ease of administration; simple rank ordering
CODAP (time spent)	Rank orders tasks on percent time performing; conducted by AOSP; large sample; surveys entire MOS; additional data available	Prioritizes tasks on one factor (percent performing); surveys will not exist for newer MOS; surveys job performance in a peacetime environment.	Surveys MOS (whole Army); simple rank ordering
DIF	3 straightforward factors; ease of administration; small sample (40); data analysis - simple; uses input from supervisors and incumbents; degree of complexity - adjustable	Crude instrument with gross task selection recommendation	Simple rank ordering (by category); little time required
Wartime/ Peacetime	Isolates combat and peacetime tasks; data easily obtained	Ignores other relevant job analysis data	Keys on combat tasks

Procedures

1. **Select Tasks Using a Comparability Analysis Approach.**
   - Obtain the Proposed System tasks from Action Step 3.
   - Obtain the comparable tasks that were used to derive the Proposed System tasks. Using the training locations indicated for these tasks, enter the Proposed System task training location on Worksheet 4.2-3.
2. **Select Tasks Using a Task Selection Model Approach.**
   - From Action Step 3, obtain the Proposed System tasks that will be analyzed using a task selection model.
   - Select and apply the desired task selection model.
   - Record all training location selections on Worksheet 4.2-3.

NOTE

The analyst can use both approaches when selecting the New System's tasks. For example, the analyst could use a task selection model for the primary operator or unit maintenance MOSs and the comparability analysis approach for support MOSs.

Procedure 1 Example

The analyst must determine the training location for a Proposed System task. The task is currently taught to MOS 33T, and now must also be taught to the 33R. The analyst uses comparability analysis to select a training location. The analyst obtains the comparable task that was used to derive the Proposed System task. The analyst determines that the location for the task is AIT. The analyst denotes AIT as the training location on Worksheet 4.2-3 as shown in Figure 4.2-7.

WORKSHEET 4.2-3

Use this worksheet to document Proposed System task information.

MOS/ASI: 33R **Skill Level:** 10 **Task Number:** 867-816-2704 **Soldier Training Publications:** STP 34-33T12-TG

Task Title: Troubleshoot Control-Indicator C-8272/TLQ-17

Subject Area: Troubleshooting the AN/TLQ-17

References: TM 32-5865-030-14-2

Equipment Numbers: E182502 E182503 E182504

Duty Position: EW/I Aviation Equipment Repairman

Training Devices: None

TRAINING LOCATION				Sustainment Training Frequency: AN Sustainment Training Skill Level: 2-4	Proposed System	Task Evaluation Code
BT: AIT: X OSUT:	PLDC: PTC: BNC:	BTC: ANC: SNC:	SGMA: UNIT: OTHER:	Drill/ARTEP Number: 34-169 3-X-1-4	Proposed 1	SKI

Figure 4.2-7. Example of a completed Proposed System task evaluation with training location.

SUBSTEP 4.2
WORKSHEETS

WORKSHEET 4.2-1

Use this worksheet to document task information from the Predecessor System and other existing systems.

Task Type:

MOS/ASI:	**Skill Level:**	**Task Number:**	**Soldier Training Publications:**
Task Title:			
Subject Area:			
References:		**Equipment Numbers:**	
Duty Position:		**Training Devices:**	

TRAINING LOCATION				**Sustainment Training Frequency:**	**Drill/ARTEP Number:**
BT: **AIT:** **OSUT:**	**PLDC:** **PTC:** **BNC:**	**BTC:** **ANC:** **SNC:**	**SGMA:** **UNIT:** **OTHER:**	**Sustainment Training Skill Level:**	

WORKSHEET 4.2-2

Use this worksheet to document BCS task information.

Task Type:

MOS/ASI:	**Skill Level:**	**Task Number:**	**Soldier Training Publications:**
Task Title:			
Subject Area:			
References:		**Equipment Numbers:**	
Duty Position:		**Training Devices:**	

TRAINING LOCATION				**Sustainment Training Frequency:** **Sustainment Training Skill Level:**	**Task Modification Code**
BT: **AIT:** **OSUT:**	**PLDC:** **PTC:** **BNC:**	**BTC:** **ANC:** **SNC:**	**SGMA:** **UNIT:** **OTHER:**	**Drill/ARTEP Number:**	**Task Deletion Code**

WORKSHEET 4.2-3

Use this worksheet to document Proposed System task information.

MOS/ASI:	**Skill Level:**	**Task Number:**	**Soldier Training Publications:**
Task Title:			
Subject Area:			
References:		**Equipment Numbers:**	
Duty Position:		**Training Devices:**	

TRAINING LOCATION				**Sustainment Training Frequency:**	**Proposed System**	**Task Evaluation Code**
				Sustainment Training Skill Level:		
BT:	**PLDC:**	**BTC:**	**SGMA:**			
AIT:	**PTC:**	**ANC:**	**UNIT:**	**Drill/ARTEP Number:**		
OSUT:	**BNC:**	**SNC:**	**OTHER:**			

Substep 4.3: Evaluate Courses of Instruction

Overview

In this substep the analyst develops quasi-programs of instruction (POI) for the Baseline Comparison System and Proposed System. The analyst evaluates the impact of the New System's design on existing courses of instruction and determines the requirements for new courses of instruction. The analyst uses comparability analysis to identify existing course modules for comparative purposes. Existing comparable course modules provide data that the analyst can use to estimate course content requirements, hours of instruction, types of instruction, and group sizes. Figure 4.3-1 is an overview of this substep.

The courses of instruction identified in Substep 4.1's New System training concept provide the focus of the evaluations conducted in this substep. The impact of each configuration's design is assessed through use of the training data source indexes also developed in Substep 4.1. These indexes provide a mission- and equipment-based focus to the course analysis.

For new courses of instruction, the indexes identify the technical training that must be added. The analyst evaluates the Predecessor System training and retains appropriate modules of instruction. The analyst reviews the training indexes to determine whether additional modules of instruction are required. The analyst modifies the training and removes redundant skill and knowledge requirements. If Substep 4.2, Evaluate Tasks, is conducted, that substep's in-depth results provide a more accurate ability to perform the course requirements analysis.

For each module of instruction, key training resource elements are identified. These elements include the types of instruction, hours of instruction, and the number of groups per instruction type. When aggregated, these elements provide essential input to the later calculation of training course costs, instructors, and man-day requirements.

In the last action step the analyst projects the aptitude and mental category requirements of the soldiers who will operate and maintain the New System. The analyst uses the Armed Services Vocational Aptitude Battery (ASVAB), the Armed Forces Qualification Test (AFQT), and reading grade level to make these projections.

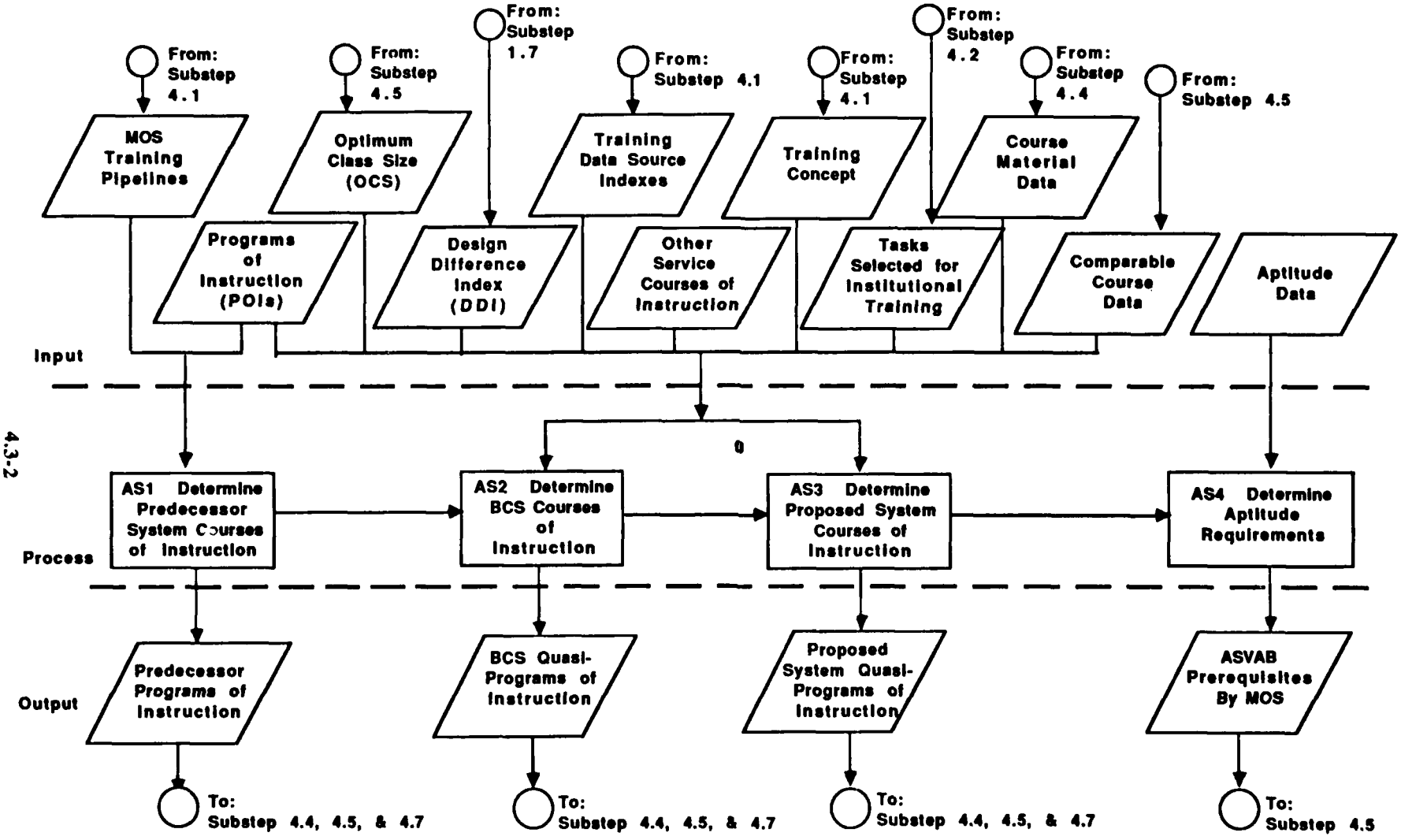


Figure 4.3-1. Overview of Substep 4.3, Evaluate Courses of Instruction.

Action Step 1: Determine Predecessor System Courses of Instruction

Discussion

In this action step the analyst documents the Predecessor System's courses of instruction.

NOTE

If the New System does not have a Predecessor System, the analyst does not perform this action step.

The analyst develops a summary of types of instruction, hours of instruction, and number of groups. The analyst determines the total course length by adding the administrative time to the academic time.

Procedures

1. **Develop Predecessor System Types of Instruction Summaries.**
   - Obtain the list of Predecessor System courses from Substep 4.1.
   - Obtain the program of instruction (POI) for each course.
   - Record a summary of the types of instruction and their hours, the total academic hours, the administrative hours, and the total course hours on Worksheet 4.3-1. In Army POIs, this summary is in TRADOC Form 377-1R, ICH Computation Summary. If this form is unavailable, add the hours for all types of instruction to complete Worksheet 4.3-1.

Procedure 1 Example

The 600-67U10 course is part of the Predecessor System. The analyst obtains TRADOC Form 377-1R, ICH Computation Summary, from the course's proponent school. Using this summary, the analyst completes Worksheet 4.3-1 as shown in Figure 4.3-2.

WORKSHEET 4.3-1

Use this worksheet to document the Predecessor System Type of Instruction Summary.

MOS/ASI: 67U **Optimum Class Size:** 12

Course Number: 600-67U10

TYPE OF INSTRUCTION	HOURS	GROUPS
C	3.0	0
C	150.1	1
TV	13.9	1
D	2.0	1
D	13.0	2
PE1	23.0	2
PE1	277.0	3
PE2	3.0	1
PE2	2.0	2
PE3	1.0	0
PE3	45.0	1
E1	8.0	1
E1	40.0	2
E3	20.0	1
Academic Hours	601.0	
Administrative Hours	75.0	
Total Hours	676.0	

Figure 4.3-2. Example of a Predecessor System Type of Instruction Summary.

Action Step 2: Determine BCS Courses of Instruction

Discussion

In this action step the analyst determines the BCS courses of instruction. The BCS courses capture the skill and knowledge requirements and the current training philosophy of the fielded BCS equipment. Accordingly, the analyst does not change the BCS course modules to account for the New System's training concept.

The analyst determines BCS course modules using the procedures in this action step and the results of Substep 4.1. The training data source indexes from Substep 4.1 describe the BCS equipment configuration, functional requirements, and generic tasks. This information serves as the focus of the BCS course evaluation process.

The analyst examines and documents course modules at a level of detail sufficient to meet BCS design requirements. The level of detail the analyst should use depends on the extent to which the New System affects existing courses and whether the analyst must develop new courses. The analyst should use as high a level of detail as possible because a typical weapon system involves many courses of instruction. If the analyst does not limit the level of detail, he or she could document large quantities of unnecessary course information.

The analyst should conduct his or her analysis at the "course level" when the New System's design does not affect the contents of an existing course. In other words, the course is required for the New System and the existing contents adequately meet the New System's requirements. At this level, the analyst uses summaries of the types of instruction, including the number of hours and groups. The analyst does not identify task numbers and detailed course breakouts of annexes and files.

The analyst should conduct his or her analysis at the "annex level" when the New System's design does not affect the contents of an existing annex. At this level, the analyst uses descriptions of the annex and summaries of the types of instruction, including number of hours and groups. The analyst does not identify task numbers for these annexes.

The analyst should conduct his or her analysis at the "file level" when the New System affects an existing course annex or when the analyst must develop a new course of instruction. At this level, the analyst uses descriptions of the file and detailed types of instruction, including number of hours and groups. The analyst also identifies task numbers for each file.

Procedures

1. **Determine BCS Course Modules.**

   - Obtain the list of BCS courses from Substep 4.1.
   - For each course, determine whether the course is affected by the New System's design. Review the MOS summary by equipment (Worksheet 2.1-1) and determine the equipment that the course's MOS supports. Locate the equipment on the appropriate training data source index (see Worksheet 4.1-1 for operators; Worksheet 4.1-2 for maintainers).
   - Compare the course number being studied with the POI number on the index.
   - If the course number is the same, retain this module(s) of instruction in the course without modification.
   - If the course number is different but is for the same MOS/ASI, ignore the course because the training for the MOS/ASI is provided in a course at a higher or lower skill level.
   - If the course number is different and is for a different MOS/ASI obtain the POI. Compare the instruction referenced on the training data source index to the instruction contained in the POI. Determine whether the referenced instruction is already being taught.
   - If the POI description is not detailed enough to make a proper assessment, consult one or more of the following sources:
     - Soldier's Manuals and other task documents that describe the tasks being taught
     - Technical Manuals, Field Manuals, draft equipment publications, and other documents referenced in the course annexes and files that specify the operational and maintenance requirements of the equipment
     - Course personnel at the school where the course is conducted
   - If comparable instruction is already contained in the course being studied, do not add the instruction. If it is not included, is only partially included, or is a new course, then develop new instruction.
   - If necessary, update the training data source indexes.

- Use Worksheet 4.3-2 to record this analysis. The worksheet is divided into two parts. Each part contains the following course information:
  - Course annex/file number
  - Descriptive title
  - Task number
  - Types of instruction
  - Number of instructional hours required by each type of instruction
  - Number of groups the class is divided into for each type of instruction
- Record the modules of instruction that will be used to build a new course or to modify an existing course on Worksheet 4.3-2 (Part I).
- Develop the new or modified course on Part II of the worksheet. Combine all existing and additional course modules into a projected course that will meet the task and skill requirements of the MOS/ASI.
- Follow the organization and descriptive format of the existing modules of instruction. Develop new instruction at the lowest level of detail available, typically, at the POI file level.

NOTE

The training analyst will encounter differences in POI annex and file numbering conventions across the various TRADOC schools and training centers. Within any one proponent school, the numerical organization and descriptive formats employed are generally very consistent.

Therefore, the formats for documenting new instruction should parallel that of the existing course. In the absence of an existing course, the analyst should follow the POI formats in TRADOC Reg 351-1, *Training Requirements Analysis System* or the formats in comparable courses of the new course's proponent school.

- Enter task numbers on Worksheet 4.3-2. If Substep 4.2, Evaluate Tasks, has not been conducted, leave this column blank.
- Use the course module evaluation codes listed in Table 4.3-1 to assess each Predecessor System or existing course module. Record the evaluation code on Worksheet 4.3-2.

Table 4.3-1. Course Module Evaluation Codes

1. Course Modification Codes

   NC - No change in course module.

   MIN - Minor course module modification – Module essentially the same. Only minor change in equipment/procedure required. No change in time required to train.

   SKI - Skill level change – Module essentially the same but assigned to different skill level/duty position.

   FRE - Frequency change – Task(s) trained in course module is performed more (less) frequently due to change in reliability, operational tempo, etc. Courses with the FRE code are further qualified by an additional code, e.g., FRE-R.

   - R - Change in Reliability
   - M - Change in Maintenance Concept/Doctrine
   - O - Change in Operational Concept/Doctrine
   - D - Degraded Operational Mode

   MAJ - Major module modification – Significant change in skill and knowledge requirements, task procedures, and/or other module characteristics. Changes required in time to train. Courses with the MAJ code are further qualified by an additional code, e.g., MAJ-D.

   - D - Change in design
   - R - Reduction in training time to remove unwanted equipment/tasks
   - A - Automation
   - O - Change in Operational Concept/Doctrine
   - M - Change in Maintenance Concept/Doctrine

2. Course Deletion Codes

   ELI - Elimination of subsystem

   AUT - Automation - Task(s) trained in course module now performed by equipment/ software

   RTF - Reduced task frequency

   MC - Change in maintenance concept/doctrine

   OC - Change in operational concept/doctrine

   SUB - Substitution of subsystem

- If Substep 4.2 was performed, reconcile the task evaluation with the course evaluation. For example, ensure that task titles and course module titles are similar and that training location and modification code decisions for the tasks crosswalk to the course decisions in this Substep.

2. **Develop BCS Types of Instruction.**

   - Determine the types of instruction for each module. Table 4.3-2 lists the types of instruction for Army courses.
   - For new course modules that are added to existing courses, alter the types of instruction specified by the comparable course modules to bring them in line with the types of instruction in the existing course.
   - For course modules that are added to new BCS courses, use types of instruction that reflect a comparable course taught at the proponent school.

NOTE

In developing new instruction, maintain the philosophy and instructional strategy of the existing course or existing comparable course. The existing course is most similar in content and is being taught at the school where the new course would be most likely taught.

   - If a module is from a non-Army course, exercise special care in identifying types of instruction. Often, Navy courses of instruction provide only a breakout of "classroom" instruction versus "laboratory" instruction.
   - Equate classroom instruction to an Army type of instruction with an instructor-to-student ratio of 1:Class. For example, conference, film, and demonstration.
   - Translate laboratory instruction to a type of instruction with an instructor-to-student ratio of 1:6. For example, Practical Exercises 1 and 2 (see Table 4.3-2).

NOTE

Army training tends to be more performance-based than Navy training. If the analyst uses large portions of Navy training, proportion the total hours of the Navy types of instruction to the performance-based types of instruction in the existing Army course. This difference is not as extreme in Marine Corps and Air Force courses of instruction.

Table 4.3-2. Types of Instruction and Associated Instructor-to-Student (I/S) Ratios

Symbol	Type of Instruction	I/S Ratio
C	Conference (or Lecture)	1:Class
CAI	Computer-Assisted Instruction	1:20
CS	Case Study	1:20
D	Demonstration	1:20
DF/SF	*Dual or Solo Flight (Aviator Courses Only)	—
E1	Hardware Performance Examination	1:6
E2	Nonhardware Performance Examination	1:6
E3	Written Examination	1:Class
EL	*Electives	1:Class
F	Film	1:Class
GS	Guest Speaker	1:Class
PE1	Practical Exercise: Hardware Oriented	1:6
PE2	Practical Exercise: Nonhardware Oriented	1:6
PE3	Practical Exercise: Classroom	1:20
PI	Programmed Instruction	1:20
S	Seminar	1:20
TV	Television	1:Class

*Typically not included in ICH computations

Self-paced (SP) and group-paced (GP) are indicated after the type of instruction symbol, e.g., CAI-SP

NOTE: TRADOC schools are not limited to the above types of instruction. An explanation for any type of instruction not specified in the regulation should be found in the course summary.

Source: TRADOC Reg 351-1, *Training Requirements Analysis System (TRAS)*

- Record the types of instruction on Worksheet 4.3-2 (Part II).

3. **Determine BCS Hours of Instruction.**

   - Determine the hours of instruction required by each new module.
   - When less than an hour is required for a POI file, convert minutes to tenths of hours as follows:

MINUTES	TENTHS
1-5	1
6-10	2
11-15	3
16-20	4
21-25	5
26-30	6
31-35	7
36-40	8
41-45	9
46-50	Full Hours

   - For course modules that are added to BCS courses, add the hours without modification. If a module contains instruction for unnecessary equipment or tasks, reduce the module hours. Contact course personnel from the existing course to assist in estimating how much the module hours should be reduced.
   - Record the hours on Worksheet 4.3-2 (Part II).

4. **Determine BCS Group Sizes.**

   - For course modules being added to existing courses, use the number of groups from the existing types of instruction.
   - If a new type of instruction must be added to the existing course, use the existing types of instruction with similar instructor-to-student ratios to estimate the number of groups.

NOTE

The existing number of groups used in a course are in TRADOC Form 377-R (ICH Computation Worksheet). These forms are not part of the POI and must be requested separately.

- For new courses of instruction, use the recommended instructor-to-student (I/S) ratios in Table 4.3-2 to estimate the number of groups. Obtain the optimum class size (OCS) for the new course from Substep 4.5. Convert the I/S ratio for each type of instruction by dividing the OCS by the number of students in the ratio. If fractional results are obtained, round to the nearest whole number.
- Record the group sizes on Worksheet 4.3-2 (Part II).

5. **Determine BCS Types of Instruction Summaries.**
   - Record on Worksheet 4.3-3 each unique combination of type of instruction and group size.
   - Add the hours to determine the total academic hours.
   - If the course is new, apply the formula used in TRADOC Reg 351-1 to calculate administrative hours (e.g., commandant's/commander's time, in-processing/out-processing, payday activities, etc.):

     $$\frac{TAH}{36} = AH$$

     Where:

     TAH = Total Academic Hours
     AH = Administrative Hours

     The divisor, 36, is the minimum academic hours per training week required by TRADOC.

   - If academic hours have been added to or deleted from an existing course, determine its administrative hours using the following formula:

     $$NCADH = \frac{ECA \times NCAH}{ECAH}$$

     Where:

     NCADH = New Course Administrative Hours
     ECA = Existing Course Administrative Hours
     NCAH = New Course Academic Hours
     ECAH = Existing Course Academic Hours

Procedure 1 Example

The analyst studies a maintenance course with five annexes: A, B, C, D, and E. Each annex pertains to a different weapon system for which the MOS has maintenance responsibility. The Predecessor System is in annex D, which is affected by the New System's design. The analyst uses course information at the annex level for annexes A, B, C, and E. He or she describes annex D at the detailed file level.

The analyst must add a new module of instruction to annex D. The Signal School, proponent for this course, numbers its files in the following format:

B	01
Annex	File Number

Twenty files in this annex are numbered from D01 to D20. The new module best fits after file D16, so the analyst numbers the new module "D17." If the existing files D17-D20 are not changed, they are increased by one to become D18-D21. The analyst changes the narrative description of each instructional module and the equipment nomenclature to reflect the New System. For example, in this course, the maintenance training for the AN/VRC-12 series radio is to be replaced by that of the new SINCGARS radio. The existing file title reads:

AN/VRC-12 Series Radio: Troubleshooting, Analysis, and Alignment

The analyst changes the file title to:

SINCGARS-V Radio: Troubleshooting, Analysis, and Alignment

Procedure 2 Example

The analyst must add a new course module on diode logic to the 101-29E10 course. The comparable module is from the 041-34Y10 course. The types of instruction for this module are PM, PE2, and E3.

The existing 101-29E10 course does not contain PM (printed materials) or PE2 (practical exercise: nonhardware-oriented). A review of the types of instruction included in the course reveals that programmed instruction (PI) is used. Further investigation shows that the PI is conveyed in printed text form. Accordingly, the analyst changes PM to PI.

(continued)

Procedure 2 Example (continued)

In evaluating PE2, the analyst determines that both PEl and PE3 are used in the 101-29E10 course. A review of the 041-34Y10 POI shows only PEl and PE2 being used. A further review of this course shows other nonhardware-oriented subject areas such as boolean algebra being taught with PE2, the more instructor-intensive type of instruction. Comparable modules in the 101-29E10 course are taught with PE3. As a result, the analyst changes PE2 to PE3.

Procedure 3 Example

A heat sensor is to be added to the barrel of a new self-propelled howitzer. The analyst must determine the maintainer course requirements. The Predecessor System does not have a heat sensor. However, a towed version of the same caliber does have such a sensor. The analyst obtains the POI for the organizational maintenance course, but the course's files show no readily identifiable training offered on the heat sensor.

The analyst surveys the tasks being taught in the course and identifies Task 061-271-1463, Maintain Thermal Warning Device. This task is trained to Soldier's Manual standard and is taught in POI file number WM28TG. The title of this file is Purge Fire Control Equipment, M198 Howitzer, and includes five hours of instruction broken down as .4 C, 4.4 PEl, and .2 PE2. Included in the file is purging of fire control items, M137 telescope, M138 telescope, M139 alignment device, M17 and M18 quadrants, and the thermal warning device.

The analyst contacts the school and learns that 1.5 hours of the total time are devoted to the thermal warning device. The analyst enters the hours for the existing module on Worksheet 4.3-2 without alteration. The same proportion of conference (C) hours to Practical Exercise 1 (PEl) hours is maintained. The analyst enters new BCS module hours as .1 C and 1.4 PE1.

After the analyst has identified the BCS course module hours, he or she assesses the design impacts of the Proposed System(s). Considerable analyst judgment is required to assess the differences. Design differences (developed in Substep 1.7) are the best source for determining equipment differences that may affect training times.

Substantial changes in equipment reliability and maintainability influence the amount of training required and, in some cases, the need for any training at all. This assessment is made easier and more accurate when Substep 4.2, Evaluate Tasks, has been conducted, because the results of the task comparability analysis are available to support this assessment.

(continued)

Procedure 3 Example (continued)

When tasks are available, the analyst uses the task evaluation codes to identify the nature of the design impacts between the BCS and the Proposed System. Further analysis may be required to assess these design impacts. The analyst should obtain the Soldier's Manuals for the tasks taught in the BCS course module, and then evaluate the task actions, conditions, standards, and elements. The analyst should compare the BCS tasks with the Proposed System tasks.

Proposed System task performance descriptions are often incomplete or missing. The analyst should use whatever task performance sources are available to make the comparison. Some of the reasons for altering the hours of a Proposed System course module include:

- Change in frequency of performance
- Change in complexity/difficulty of performance
- Consequences of inadequate performance

Procedure 4 Example

The analyst must add a course module from the 600-67T10 course to the existing 600-67U10 course. The 600-67T10 course has an optimum class size of 8 and the types of instruction and group sizes for the course module are as follows:

C	1
PE1	4
E1	4

The 600-67TU10 course has an optimum class size of 6 and these same types of instruction have the following group sizes:

C	1
PE1	3
E1	3

Therefore, the analyst changes the group sizes for the new course module from 600-67T10 in the 600-67U10 course to conform with its existing group sizes and optimum class size.

Procedure 5 Example

After the analyst completes the BCS course analysis for the 600-67U10 course, he or she develops a summary of types of instruction, group sizes, and instructional hours. The academic hours were determined by totaling all hours. Because this analysis reflected a modification to an existing course, the analyst uses the following formula to determine the new course administrative hours:

$$\text{NCADH} = \frac{75.0 \times 631.0}{676.0} = 70.0$$

The results of applying this procedure are shown in Figure 4.3-3.

WORKSHEET 4.3-3

Use this worksheet to document the BCS Type of Instruction Summary.

MOS/ASI: 67U **Optimum Class Size:** 12

Course Number: 600-67U10

TYPE OF INSTRUCTION	HOURS	GROUPS
C	3.0	0
C	152.1	1
TV	13.9	1
D	2.0	1
D	14.0	2
PE1	23.0	2
PE1	300.0	3
PE2	3.0	1
PE2	2.0	2
PE3	1.0	0
PE3	47.0	1
E1	8.0	1
E1	42.0	2
E3	20.0	1
Academic Hours	631.0	
Administrative Hours	70.0	
Total Hours	701.0	

Figure 4.3-3. Example of a BCS Type of Instruction Summary.

Action Step 3: Determine Proposed System Courses of Instruction

Discussion

In this action step the analyst evaluates each BCS course module to determine whether the modules reflect the New System's design and training concept. The analyst accomplishes this evaluation using course module evaluation codes that result in the inclusion, further evaluation, or deletion of the BCS course module.

The analyst uses applicable BCS course modules and additional new modules to develop Proposed System courses. The analyst describes each Proposed System course, including course content, hours of instruction, types of instruction, and group sizes.

In making the evaluations in this action step, the analyst uses sources that describe the task performance and skill and knowledge requirements of both the BCS course module and the Proposed System course module. These sources include Trainer's Guides, Soldier's Manuals, programs of instruction, subject-matter experts at the proponent school, and information describing the New System design.

The analyst alters the hours of instruction, types of instruction, and group sizes to: (1) reflect changes in New System design that impact BCS course modules, (2) take into account redundant skill, knowledge, and/or task requirements between existing BCS course modules and new course modules required by the Proposed System, and (3) reflect New System training concepts such as the proposed use of training devices, training equipment, and media that will require changes in types of instruction, hours, group sizes, and optimum class sizes.

The New System's training concept, which was developed in Substep 4.1, is important input to this action step. In this action step the analyst has further opportunities to incorporate the New System's institutional training strategy and training device/equipment strategy into the analysis. However, the analyst should not introduce too many new study variables that will make interpreting the results difficult.

For those components of the New System's training concept that are significantly different from the current training concept, the analyst should evaluate these differences by developing another Proposed System or conducting a tradeoff. In this way, initial HCM analysis results will more clearly assess the impact of the New System's design, force structure, and employment characteristics. These baseline results can then be used to assess New System and/or other training concept alternatives.

Procedures

1. **Determine Proposed System Course Modules.**

   - Obtain the list of Proposed System courses from Substep 4.1. For each course complete the following information on Worksheet 4.3-4:

     - MOS/ASI
     - Course Number

   - Obtain the BCS courses and course modules from Action Step 2.

   - Compare the Proposed System and BCS course numbers.

   - If the MOS/ASI and course numbers are the same, record the BCS course modules on Worksheet 4.3-4 (Part I). Use the appropriate training data source index (see Worksheet 4.1-1 for operators; Worksheet 4.1-2 for maintainers) to determine if additional course modules must be added.

   - If the MOS/ASI and course number are not part of the BCS or if additional instruction must be added to the course, identify comparable course modules using the BCS procedures described in Action Step 2. Document the results of this analysis on Worksheet 4.3-4 (Part I).

   - If necessary, update the training data source indexes.

   - Develop the new or modified Proposed System course on Worksheet 4.3-4 (Part II). Combine all existing and additional course modules into a projected course that will meet the task and skill requirements of the MOS/ASI.

   - Use the course module evaluation codes listed in Table 4.3-1 to assess each BCS or existing course module. Record an evaluation code on Worksheet 4.3-4 (Part I).

- If Substep 4.2 was performed, reconcile all elements of the task evaluation with the course evaluation.

2. **Determine Proposed System Types of Instruction, Hours, and Groups.**

   - Obtain the New System's training concept from Substep 4.1.
   - Use the training concept and any other sources that describe the Proposed System's courses to determine each course module's types of instruction, hours, and groups.

   NOTE

   The analyst can use programs of instruction developed for operational test (OT) training, new equipment training (NET), instructor and key personnel training (IKPT), and contractor-developed training. However, these courses are typically developed for different training purposes, and conducted with different target populations at different training locations from the HCM steady-state TRADOC-school environment.

   - Follow the formats and procedures used in Action Step 2, Procedures 2, 3, and 4 to document the BCS types of instruction, hours, and groups.
   - Record the types of instruction, hours, and groups on Worksheet 4.3-4 (Part II).

Procedure 1 Example

The analyst must evaluate a Proposed System that incorporates equipment design changes to an Army helicopter. The analyst obtains the Proposed System courses from Substep 4.1. The 602-68F10 course provides initial entry training (IET) for MOS 68F, Aircraft Electrician. Mos 68F repairs the electrical systems of all Army aircraft.

The analyst obtains the BCS 602-68F10 course. The analyst uses the BCS course modules to build the Proposed System course. The analyst studies the maintainer training data source index and determines that the MIL-STD-1553 Digital Data Bus will be used on the Proposed System. The data bus was not part of the BCS. The 601-ASIW5 course, identified on the index, is the source of existing MIL-STD-1553 Digital Data Bus training. The analyst must add this training to the Proposed System's 602-68F10 course.

The analyst uses the course module evaluation codes listed in Table 4.3-1 to evaluate the BCS course modules. Annex A contains basic aircraft electrical/electronics training that may be effected by the new data bus. The analyst reviews the 601-ASIW5 course to determine whether any additional basic electronics skills and knowledge are taught beyond what is already in the 602-68F10 course. The analyst does not identify a need for any additional skills and knowledge. The analyst uses the NC (no change) code for this annex and it becomes part of the 602-68F10 course.

Annex B includes MOS 68F general subjects that are not effected by differences in aircraft technology. The analyst uses the NC code on this annex as well. Annexes C, D, E, and G are specific to other Army aircraft. The analyst uses the NC code.

Annex F is specific to the helicopter being studied. The analyst entered this annex at the file level for the BCS analysis. The analyst adds the training for the data bus to this annex. Because Substep 4.2, Evaluate Tasks, was not performed, the analyst must study the Soldier's Manual and Technical Manual that pertain to the data bus to determine whether the data bus training is already present. The analyst determines that the data bus training is not included; he or she then adds file F05 to annex F. The analyst also adds the performance examination that is associated with this file (F06). Because the troubleshoot and replace data bus tasks will require minor changes, the analyst uses the MIN (minor) code.

Procedure 2 Example

The types of instruction in the 601-ASIW6 course are identical to those in the 602-68F10 course. The analyst uses the types of instruction for the new files without change. The analyst does not find any redundant or overlapping training in the new files. The same MOSs attend both courses, therefore, they have the same aptitude background. The analyst does not make any changes to the 602-68F10 course.

The group sizes are the same except for the PE1 type of instruction. The analyst uses the other group sizes without change. The analyst changes the PE1 group size from four to three. Figure 4.3-4 is an example of the completed analysis for annex F.

WORKSHEET 4.3-4 (Part I)

Use this worksheet to develop Proposed System courses.

MOS/ASI: 68F

Course Number: 602-68F10 BCS and/or Other Existing Courses

Course Number	OCS	Service	Module Number	Module Title	Task Number	Type of Instruction	Hours	Groups	Course Evaluation Code
602-68F10	10	Army	F	CH-47C/D Electrical System Maintenance					
602-68F10	10	Army	F01	CH-47C Electrical System Maintenance		C TV D PE1	11.5 1.0 .5 27.0	1 1 2 3	NC
602-68F10	10	Army	F02	Performance Examination		E1	3.0	4	NC
602-68F10	10	Army	F03	CH-47D Electrical System Maintenance		C TV D PE1 PE3	12.5 1.0 1.5 19.0 1.0	1 1 2 3 2	NC
602-68F10	10	Army	F04	Performance Examination		E1	3.0	4	NC
601-ASIW5	8	Army	300-435-21	Troubleshoot/ Replace MIL-STD-1553 Digital Data Base		C PE1	0.5 2.5	1 4	MIN
601-ASIW5	8	Army	300-435-21	Performance Examination		E1	1.0	2	MIN

Figure 4.3-4. Example of a Proposed System course evaluation.

WORKSHEET 4.3-4 (PART II)

Use this worksheet to develop Proposed System courses.

MOS/ASI: 68F
Course Number: 602-68F10 **Proposed System Course**

Annex Number	File Number	Module Title	Task Number	Type of Instruction	Hours	Groups
F		CH-47C/D Electrical System Maintenance				
F	01	CH-47C Electrical System Maintenance		C TV D PE1	11.5 1.0 .5 27.0	1 1 2 3
F	02	Performance Examination		E1	3.0	4
F	03	CH-47D Electrical System Maintenance		C TV D PE1 PE3	12.5 1.0 1.5 19.0 1.0	1 1 2 3 2
F	04	Performance Examination		E1	5.0	4
F	05	Troubleshoot/ Replace MIL-STD-1553 Digital Data Bus		C PE1	0.5 2.5	1 3
F	06	Performance Examination		E1	1.0	4

Figure 4.3-4. Example of a Proposed System course evaluation (continued).

Action Step 4: Assess Aptitude and Mental Category Requirements

Discussion

In this action step the analyst projects the aptitude and mental category requirements of the soldiers who will operate and maintain the New System. Determining the aptitude and mental category requirements of these soldiers is important to the Army because soldiers in the higher mental categories are a limited resource.

NOTE

The analyst does not estimate the aptitude and mental category of soldiers in an existing MOS whose training has not been modified by the HCM training analysis.

The analyst uses three types of MOSs in this action step: "target," "comparable," and "source." A target MOS is a new or existing MOS whose training changes as a result of the HCM training analysis. A comparable MOS is an MOS whose training the analyst used to develop the target MOS's training. The course a comparable MOS currently attends is a comparable course. A source MOS is an MOS that could supply personnel to fill the target MOS.

The analyst uses the Armed Services Vocational Aptitude Battery (ASVAB) to determine the aptitude requirements of each target MOS. Each of the Armed Services uses the ASVAB to classify and select recruits. However, each service combines the subtests into different aptitude areas (AA). Aptitude areas are composites of two or more of the ASVAB subtests. Table 4.3-3 shows the 10 ASVAB subtests and the Army's AA composites.

Every Army training course requires a minimum AA score as a prerequisite. The Training and Doctrine Command (TRADOC) schools have found the required AA scores to be good predictors of both academic and job success.

The analyst's first objective is to determine the target MOS's AA prerequisite scores. The analyst uses the comparable courses' AA scores to determine the target MOS's AA scores. Adopting comparable course AA scores is a rough method of estimating the target MOS's aptitude requirements. In previous action steps, the analyst "borrowed" instruction from the comparable courses to "build" the target MOS's course. The analyst may have used entire pieces of instruction from the course or only one or two tasks from the course. The analyst must use the AA score for the entire course; however, because tasks vary in complexity, the course's AA score may not apply to every task in the course.

Table 4.3-3. The 10 ASVAB Subtests

SUBTESTS	ABBREVIATION
GENERAL SCIENCE	(GS)
ARITHMETIC REASONING	(AR)
WORD KNOWLEDGE	(WK)
PARAGRAPH COMPREHENSION	(PC)
NUMERICAL OPERATIONS	(NO)
CODING SPEED	(CS)
AUTO/SHOP INFORMATION	(AS)
MATHEMATICS KNOWLEDGE	(MK)
MECHANICAL COMPREHENSION	(MC
ELECTRONICS INFORMATION	(EI)

For the purpose of Army selection and classification, ASVAB subtests are combined into Aptitude Area (AA) Composites.

	APTITUDE AREAS (AA)	ASVAB SUBTESTS IN EACH AA COMPOSITE
(AFQT)	ARMED FORCES QUALIFICATION TEST	= VE + AR + .5NO
(EL)	ELECTRONICS	= AR + EI + MK + GS
(OF)	OPERATORS/FOODS	= NO + VE + MC + AS
(SC)	SURVEILLANCE/COMMUNICATIONS	= NO + CS + VE + AS
(MM)	MOTOR MAINTENANCE	= NO + EI + MC + AS
(CL)	CLERICAL	= NO + CS + VE
(ST)	SKILLED TECHNICAL	= VE + MK + MC + GS
(CO)	COMBAT	= AR + CS + MC + AS
(FA)	FIELD ARTILLERY	= AR + CS + MC + MK
(GT)	GENERAL TECHNICAL	= VE + AR
(GM)	GENERAL MAINTENANCE	= MK + EI + GS + AS

VE = VERBAL - A COMBINATION OF WORD KNOWLEDGE AND PARAGRAPH COMPREHENSION

NOTE

The analyst should review the target MOS's course to ensure that common or redundant tasks were taken from the comparable course with the least stringent aptitude requirement.

The analyst can also determine the target MOS's aptitude requirements on a task-by-task basis. He or she can use rough estimates or more sophisticated methods to determine these requirements. This action step contains an optional procedure that describes a rough method of estimating task aptitude requirements. More sophisticated methods are described in the documents listed in the task assessment reference list at the back of this action step. This list contains research studies that describe methods for determining task aptitude requirements. These detailed methods are usually manual or automated rating procedures that require many subject-matter experts (SMEs), job incumbents, and/or military psychologists.

The method for roughly assessing the aptitude of specific tasks described in this action step is a subjective review of each comparable MOS's tasks. The analyst determines the aptitude requirement for each task. He or she then determines the target MOS's aptitude requirements based on the task aptitude requirements.

After the analyst has determined the target MOS's AA prerequisite scores, he or she determines the percentage of soldiers in the source MOSs that meet these aptitude requirements.

The analyst should limit the source MOSs to the New System's functional branch unless directed otherwise by the Technical Advisory Group (TAG). For example, if the New System is a helicopter, the source MOSs must come from the CMFs that support helicopters because the MOSs in these CMFs will probably supply the personnel who will support the New System.

After the analyst determines the target MOS's aptitude requirements, he or she uses the Armed Forces Qualification Test (AFQT) to determine the target MOS's mental category. The services use the Armed Forces Qualification Test, which is a composite of ASVAB subtests, to place military applicants into five mental categories. Table 4.3-4 lists the AFQT score ranges used to assign applicants to mental categories I through V. The analyst uses the General Technical (GT) aptitude area score to determine the target MOS's reading grade level. The analyst will assess the impact of the target MOS's aptitude and mental category requirements in Substep 5.3.

Table 4.3-4. AFQT Ranges

Mental Categories (MC)	AFQT Score Range
I	(93 - 99)
II	(65 - 92)
IIIA	(50 - 64)
IIIB	(31 - 49)
IV	(10 - 30)
V *	(1 - 9)

* Mental Category V Are Not Eligible for Enlistment

The analyst uses several data sources to complete this action step. Some of these data may have been obtained during the development of the Current Target Audience Description (Substep 3.1). Other data must be obtained from the automated Enlisted Master File (EMF). The Personnel Proponency Office at each TRADOC school has access to the EMF. The New System's Proponency Office must ask the school's Personnel Proponency Office to add specific extract routines to its EMF access file. These data can then be made available to the HCM analyst.

The analyst makes several assumptions in performing this action step:

- HCM task comparability assumptions are accurate.
- HCM New System training projections are accurate.
- The AA prerequisite score for each existing course will remain fixed. (The Army continuously reviews and adjusts these scores based on the quality of annual accessions and the rate of students failing or recycling in courses.)
- The AA composite scores used in the existing courses are accurate predictors of job and academic success.
- Recruits are motivated when they take the ASVAB.
- Soldiers are motivated in their coursework.
- This action step is intended for use with entry-level (Skill Level 1) courses. If the procedure is applied to higher skill levels, the analyst must assume that advanced courses require the same aptitudes as entry-level courses because the Army does not set specific aptitude requirements for the upper skill-level courses.

Procedures

1. **Obtain Target MOSs and Comparable MOSs.**
   - Obtain the MOSs that will require additional training for the New System (i.e., target MOSs) from Action Steps 2 and 3.
   - Obtain the comparable courses and MOSs used as a source of training for the target MOSs from Action Steps 2 and 3.
2. **Determine Each Target MOS's AA Prerequisite Scores.**
   - Record the comparable MOSs and courses on Worksheet 4.3-5.
   - If the target MOS is an existing MOS record the target MOS and course number on Worksheet 4.3-5.

- Obtain the AA prerequisite score for each course from DA PAM 351-4 and record them on Worksheet 4.3-5.
- If the target MOS has only one AA prerequisite score and it is higher than the other MOSs' scores, the target MOS's aptitude requirement remains the same. Do not continue with this action step.
- Select the highest prerequisite score for each AA required by the target MOS and record it on Worksheet 4.3-6.

3. **Optional Procedure. Examine the Tasks Trained in Each New System Course.**
   - Obtain the task list for each New System course from Action Step 3.
   - Apply one of the task evaluation procedures listed in the task assessment reference list provided at the back of this action step. Or, make a subjective appraisal of the aptitude required for each comparable task.
4. **Obtain Data.**
   - Ask the Personnel Proponency Office of the New System's proponent school to create routines to generate an Aptitude Area Score report and a Mental Category report from the EMF. Request these reports for each target and comparable MOS.
5. **Determine the Percentage of Soldiers in Each Source MOS That Meets the Target MOS's AA Prerequisite Score(s).**
   - Select the source MOSs from the list of comparable MOSs on Worksheet 4.3-5 and record them on Worksheet 4.3-7.
   - Across from each source MOS on Worksheet 4.3-7, list the target MOS's AA prerequisite scores (from Worksheet 4.3-6).
   - Obtain from the Aptitude Area Score report the AA score ranges and the percentage of soldiers in each range. Record these values on Worksheet 4.3-7.
   - Add the percentages in the score ranges above the AA prerequisite score. Record this total on Worksheet 4.3-7.
   - Add the percentages in the score ranges below the AA prerequisite score. Record this total on Worksheet 4.3-7.

6. **Determine the Percentage of Soldiers in Each Source MOS That Meets an Average AFQT Score.**

   - List the source MOSs on Worksheet 4.3-8.
   - Obtain from the Mental Category report the percentage of soldiers in each AFQT score range and the average AFQT score. Record these values for each source MOS on Worksheet 4.3-8.
   - Calculate the percentage of soldiers in mental categories at and above the mean AFQT. Record this percentage on Worksheet 4.3-8.
   - Calculate the percentage of soldiers in mental categories below the mean AFQT. Record this percentage on Worksheet 4.3-8.

7. **Determine Reading Grade Levels.**

   - List the source MOSs on Worksheet 4.3-9.
   - Record the mean GT score for each MOS.
   - Obtain the average reading grade level of the source MOSs from Table 4.3-5.

Table 4.3-5. Reading Grade Level Conversion Chart

Conversion Table

GT Standard Scores to Grade Level Equivalents

ASVAB 8/14

GT Standard Score			GT Standard Score		
1944 Metric	1980 Metric	Grade Level Equivalent	1944 Metric	1980 Metric	Grade Level Equivalent
52	56	3.4	93	94	8.5
54	57	3.6	94	95	8.6
56	58	3.8	95	96	8.7
57	59	4.0	96	97	8.8
59	60	4.3	97	98	8.9
61	61	4.6	98	99	9.0
62	62	4.7	99	100	9.2
63	63	5.0	100	101	9.4
64	64	5.2	102	102	9.5
65	66	5.4	103	103	9.6
66	67	5.5	104	103	9.8
67	68	5.6	105	105	10.0
68	69	5.7	106	108	10.3
70	70	5.8	107	109	10.4
71	71	6.0	109	109	10.5
72	72	6.2	110	110	10.7
73	73	6.3	111	111	10.8
74	74	6.5	112	112	11.0
75	75	6.6	113	113	11.1
76	76	6.7	114	114	11.3
77	77	6.8	116	116	11.5
78	78	6.9	117	117	11.6
79	80	7.0	118	117	11.7
80	81	7.2	119	118	11.7
81	82	7.3	120	120	11.8
82	83	7.4	121	121	11.9
83	84	7.5	122	122	12.0
84	85	7.6	123	123	12.1
85	86	7.7	125	124	12.2
86	87	7.8	126	125	12.3
87	88	7.9	128	126	12.4
89	89	8.0	130	127	12.6
90	90	8.1	133	128	12.7*
91	91	8.3	137	129	12.8*
92	93	8.4	147	130	12.9*

*Conversions in this range of scores may be unreliable

Procedure 1 Example

A target MOS is a new MOS or an existing MOS that required modifications to its current training. The target MOS in this example is the 13X, a notional MOS that must perform operator tasks for a new remotely piloted vehicle. The analyst obtains a list of the comparable courses used to develop the 13X's training. The comparable courses and MOSs are:

13C	250-13C10
13F	250-13F10
13R	250-13R10
72E	260-72E10
82C	412-82C10
96B	243-96B10
96D	242-96D10
96H	233-96H10

Procedure 2 Example

The analyst obtains the aptitude area prerequisite scores for each comparable course from DA Pam 351-4.

Target MOS: 13X
Weapon System: Remotely Piloted Vehicle

MOS	Course Number	AA Prerequisite Score		
13C	250-13C10	(ST)	95	
13F	250-13F10	(FA)	100	
13R	221-13R10	(SC)	100	
72E	260-72E10	(SC)	90	
82C	412-82C10	(ST)	95	
96B	243-96B10	(ST)	105	
96D	242-96D10	(ST)	95	
96H	233-96H10	(SC)	95	(ST)95

The analyst must determine the AA composite test(s) required by the target MOS and the prerequisite score for each. The analyst identifies the AA tests required by each comparable course as those required by the target MOS. The analyst then determines which course has the highest score and selects that score as that required by the target MOS. The 13X requires AA prerequisite scores of (FA) 100, (SC) 100, and (ST) 105.

Procedure 3 Example

If the analyst decides to use this optional procedure, he or she must select a task analysis procedure. A separate reference list of job/task assessment procedures follows these examples.

In this example, the analyst uses expert judgment to review the tasks selected from each comparable MOS. The new MOS, 13X, requires target acquisition/imagery interpretation skills, common to some intelligence MOSs, as well as specific Field Artillery (FA) skills, such as, target designation, FA communication procedures, and calls for fire within the FA Tactical Operations Center (TOC) communications network. Figure 4.3-5 provides a sample of the tasks taken from the FA and Intelligence MOSs. As shown in this figure the aptitude requirements for four tasks could be eliminated in the subjective judgment of the analyst. The analyst eliminates four tasks: a common soldier task that involves storing a protective mask, a task that requires the completion of a form, and two tasks involving the operation and minor maintenance of a standard radio. The aptitude requirements of these tasks is judged to be within the ability of any of the potential source MOS. The 13R performs a number of much more complex tasks, as can be seen in this partial listing. However, the analyst can not eliminate all of the tasks, so the SC score of 100 can not be eliminated.

The analyst can use one of the more sophisticated techniques that are referenced at the back of this action step to determine task aptitude requirements. However, these techniques usually require subject-matter experts (SME) or military psychologists to evaluate each task.

Eliminate Aptitude Requirements for This Task	MOS	Skill Level	Task Number	Task Title
*	13R	10	031-503-1003	Store M-17 Series Protective Mask with Hood Carrier
	13R	10	061-294-1004	Perform the AN/TPQ-37 Radar Set Startup Procedures
	13R	10	061-294-1008	Performs Operators PMCS on the AN/TPQ-37 Radar Set
	13R	10	061-294-1109	Performs PMCS on the 60-KW Generator
	13R	10	061-294-1114	Start/Operate/Stop the 60KW Generator Set
	13R	10	061-295-1000	Perform Organizational PMCS on the Trailer of the AN/TPQ-36
	13R	10	061-295-1201	Perform OCM on the Receiver Unit of the AN/TPQ-37
	13R	10	061-295-1206	Perform the Telescope Reticle Illum on the Adjustment on AN/TPQ-37
	13R	10	061-295-1210	Perform OCM on the Antenna Positioning System of the AN/TPQ-37
	13R	10	061-295-1405	Perform OCM on the Signal Processor Unit
	13R	10	061-295-1409	Perform OCM on the Line Printer
	13R	10	061-295-1413	Perform OCM on the Computer Memory Power Supplies
*	13R	10	061-295-1414	Maintain DA Form 2404 (Equipment Inspection & Maintenance Worksheet)
*	13R	10	113-587-2003	Operate Radio Set AN/VRC-46 (AN/VRC-12 Series)
*	13R	10	113-587-3007	Performs Operators PMCS on Radio Sets AN/VRC-12 Series

The first three digits of the task number code designate the task source:

031 - Common Soldier Tasks
061 - Field Artillery School Tasks
113 - Signal School Tasks

Figure 4.3-5. Example of a subjective task evaluation.

Procedure 4 Example

YOUR LETTERHEAD
DATE

YOUR OFFICE SYMBOL

SUBJECT: Request for EMF Queries

Commander
USA Soldier Support Center
SSC-NCR Liaison Office
ATTN: ATNC-CL (Mr. Lynn Matheson)
Building 401A
Fort Benjamin Harrison, IN 46216-5080

1. We are estimating the aptitude and mental category requirements for new Army weapon systems. As part of this effort, we need data from the Enlisted Master File (EMF).

2. It is requested that the following EMF query routines be added to the EMF access file of our Personnel Proponency Office:

   Report Name
   Mental Category
   Aptitude Area Score
   Average AFQT Score
   Average Aptitude Score

FOR THE COMMANDER

YOUR SIGNATURE BLOCK

Procedure 5 Example

The analyst must determine the source MOSs. Usually, the source MOSs will be from the weapon system's functional branch. The Technical Advisory Group, however, must make this decision. In this example, the source MOSs are all MOSs used as comparable MOSs because the decision to place the RPV in Field Artillery or Intelligence units had not yet been made.

The analyst lists the source MOSs and the AA prerequisite scores for the target MOS. The analyst then records the percentage of each source MOS in each AA score range. An example of these data formats and calculations is shown in Figure 4.3-6.

The shaded blocks in the figure indicate the percentage of soldiers in each source MOS with scores above the target MOS's AA prerequisite scores. The analyst must add the percentage of soldiers in each score range to determine the total percentage of the source MOS that is eligible to become a 13X. The information developed by this procedure will be discussed further in Substep 5.3, Impact Analysis. This information will assist Army personnel planners and the TRADOC schools in making important decisions.

Procedure 6 Example

The analyst obtains the percentage of soldiers in each source MOS that scored in each mental category (CAT I, II, IIIa, IIIb) from the EMF extract reports.

Mental Categories

MOS	I	II	IIIa	IIIb	IV
13C	5.88	38.51	24.47	25.7	5.44
13F	4.94	37.33	26.50	25.57	5.66
13R	4.72	31.81	27.36	32.08	4.04
72E	2.63	25.88	25.29	40.08	6.12
82C	4.91	33.88	26.09	30.10	5.03
96B	9.91	52.02	21.11	13.89	3.07
96D	10.07	48.50	23.66	15.42	2.35
96H	9.52	53.57	25.00	8.33	3.57

The analyst then calculates the mean AFQT for each MOS and identifies the highest AFQT score.

(continued)

Target MOS: 13X

Weapon System: RPV

Source MOS	Target MOS Prerequisite Scores	% of Comparable MOS by AA Composite Score Range												% of Soldiers in Comparable MOS Above the Highest AA Cut-off	% of Soldiers in Comparable MOS Below the Highest AA Cut-off
		00-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119	120-124	125-129	129-160		
13C (ST) 95	FA 100	1.22	2.57	2.84	5.14	12.58	11.37	15.29	14.34	12.99	9.47	6.36	5.82	76%	24%
	SC 100	1.22	1.62	3.92	7.31	13.80	12.18	15.02	11.91	10.83	10.01	7.58	4.60	72	28
	ST 105	.39	.13	1.32	2.89	15.13	16.45	16.58	13.29	12.37	8.29	7.76	5.39	64	36
* 13F (FA) 100	FA 100	.36	.36	.36	1.43	1.93	23.24	19.50	15.95	14.02	10.06	7.09	5.69	96	4
	SC 100	.98	1.86	3.38	6.06	9.03	10.53	13.79	14.04	14.75	11.62	8.74	5.22	79	21
	ST 105	1.12	1.79	3.61	6.40	10.36	12.32	15.62	14.58	12.25	9.92	7.50	4.52	64	36
13R (SC) 100	FA 100	1.38	.92	2.77	9.85	13.38	15.09	14.46	12.15	14.62	7.23	3.54	4.62	72	28
	SC 100	.31	.15	1.68	2.14	2.45	25.54	21.67	12.39	14.36	10.09	4.13	4.43	93	7
	ST 105	1.97	2.88	4.10	9.56	14.57	13.51	14.42	12.75	9.28	8.19	5.46	3.34	53	47
82C (ST) 95	FA 100	.77	1.76	2.75	7.11	13.17	14.30	14.15	13.59	12.68	11.13	8.01	4.58	74%	26%
	SC 100	1.20	1.41	5.14	7.25	11.33	13.79	14.92	13.02	13.72	8.94	5.63	3.86	74	26
	ST 105	.68	.27	.75	1.09	17.90	18.65	15.84	14.00	12.30	9.02	5.74	3.96	61	39

* Identified as Primary Source MOS

Figure 4.3-6. An example of the data format and calculations for Procedure 4.

Target MOS: 13X

Weapon System: RPV

Comparable MOS and Current AA Prerequisite	Highest Comparable AA Cut Off	% of Comparable MOS by AA Composite Score Range												% of Soldiers in Comparable MOS Above the AA Cut-off	% of Soldiers in Comparable MOS Below the AA Cut-off
		00-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119	120-124	125-129	129-160		
96B (ST) 105	FA 100	.45	.55	.81	2.32	6.30	9.23	13.31	15.33	17.85	13.92	9.48	10.44	90	10
	SC 100	.77	.43	1.40	4.15	7.96	9.94	15.34	14.62	14.95	14.47	8.97	8.99	85	15
	ST 105	.66	.23	.70	1.46	3.43	4.74	18.69	18.79	17.90	14.23	11.32	7.84	89	11
96D (ST) 95	FA 100	.18	1.08	.90	2.87	8.24	12.01	12.01	15.23	15.05	14.87	8.78	8.78	87	13
	SC 100	1.05	1.05	3.51	5.62	8.79	11.78	11.78	12.83	14.94	13.01	10.02	5.62	80	20
	ST 105	.52	.87	.52	1.22	10.10	12.72	15.85	13.76	14.11	14.63	9.58	6.10	74	26
96H (SC 95) (ST 95)	FA 100	.78	-	-	3.13	3.91	8.59	7.81	17.97	17.97	21.09	8.25	12.50	92	8
	SC 100	.78	-	.78	1.55	6.98	11.63	9.30	12.40	18.60	17.05	12.40	8.53	90	10
	ST 105	1.52	.76	1.52	1.52	4.55	6.06	8.33	20.45	18.94	14.39	12.88	9.09	84	16
72E (SC) 90	FA 100	3.29	3.94	5.87	10.91	16.55	14.27	12.25	10.28	8.58	6.74	3.65	2.69	58	42
	SC 100	1.35	1.27	1.88	21.44	18.27	14.25	12.78	9.55	7.93	6.43	2.85	2.01	56	44
	ST 105	4.29	4.28	9.21	14.68	15.40	13.21	11.38	8.89	7.69	5.92	3.07	1.67	38	62

Figure 4.3-6. An example of the data format and calculations for Procedure 4 (Continued).

Procedure 6 Example (continued)

MOS	Mean AFQT	
13C	(61.021)	61
13F	(60.358)	60
13R	(58.237)	58
72E	(53.821)	54
82C	(58.891)	59
96B	(68.643)	69
96D	(67.850)	68
96H	(70.899)	71

The analyst then determines the mental category this highest mean represents.

AFQT score of 71 = mental category II

The analyst must calculate the percentage of soldiers in each MOS that are above and below that mental category.

MOS	MC I		MC II			Percentage of Soldiers Above MC	Percentage of Soldiers Below MC
13C	5.88	+	38.51	=	44.39	44	56
13F	4.94	+	37.33	=	42.27	42	58
13R	4.72	+	31.81	=	36.53	37	63
72E	2.63	+	25.88	=	28.51	29	71
82C	4.91	+	33.88	=	38.79	39	61
96B	9.91	+	52.02	=	61.93	62	38
96D	10.07	+	48.50	=	58.57	59	41
96H	9.52	+	53.57	=	63.09	63	37

Procedure 7 Example

The analyst uses Table 4.3-5 to obtain the reading grade level from the GT score.

MOS	Mean GT Score	Minimum Reading Grade Level for 95% of MOS
13C	111.527	6.9
13F	110.100	6.9
13R	109.025	6.9
72E	106.455	6.6
82C	110.338	7.2
96B	117.054	8.3
96D	115.759	7.9
96H	117.235	8.6

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SUBSTEP 4.3
WORKSHEETS

WORKSHEET 4.3-1

Use this worksheet to document the Predecessor System Type of Instruction Summary.

MOS/ASI: **Optimum Class Size:**

Course Number:

TYPE OF INSTRUCTION	HOURS	GROUPS
Academic Hours		
Administrative Hours		
Total Hours		

WORKSHEET 4.3-2 (Part I)

Use this worksheet to develop BCS courses.

MOS/ASI: **Course Number:**

Predecessor System and/or Other Existing Courses

Course Number	OCS	Service	Module Number	Module Title	Task Number	Type of Instruction	Hours	Groups	Course Evaluation Code

WORKSHEET 4.3-2 (PART II)

Use this worksheet to develop BCS courses.

MOS/ASI: **Course Number:**

BCS Course

Annex Number	File Number	Module Title	Task Number	Type of Instruction	Hours	Groups

WORKSHEET 4.3-3

Use this worksheet to document the BCS Type of Instruction Summary.

MOS/ASI: **Optimum Class Size:**

Course Number:

TYPE OF INSTRUCTION	HOURS	GROUPS
Academic Hours		
Administrative Hours		
Total Hours		

WORKSHEET 4.3-5

Use this worksheet to record each comparable course's AA prerequisite score.

Target MOS:____

Comparable		AA PREREQUISITE SCORE									
MOS	Course Number	CL	CO	EL	FA	GA	GT	MM	OF	SC	ST

WORKSHEET 4.3-6

Use this worksheet to record the target MOS's AA prerequisite scores.

Target MOS: ____

AA Composite Test	Prerequisite Score

WORKSHEET 4.3-7

Use this worksheet to record the AA composite score ranges for each source MOS.

Target MOS: _____

Source MOS	Target MOS Prerequisite Scores	% of Source MOS by Score Range												% of Soldiers in Source MOS Above the AA Score	% of Soldiers in Source MOS Below the AA Score
		00-79	80-84	85-89	90-94	95-99	100-104	105-109	110-114	115-119	120-124	125-129	129-160		

WORKSHEET 4.3-8

Use this worksheet to record the AFQT scores by mental category for each source MOS.

Target MOS:_____

Source MOS	% of Source MOS in each Mental Category					Mean AFQT	% Soldiers in each Source MOS Above the Mean AFQT	% Soldiers in each Source MOS Below the Mean AFQT
	I	II	IIIA	IIIB	IV			
	(93 - 99)	(65 - 92)	(50 - 64)	(31 - 49)	(10 - 30)			

WORKSHEET 4.3-9

Use this worksheet to record the range of reading abilities in each comparable MOS.

Target MOS: _____

Source MOS	Mean GT Score	Minimum Reading Grade Level 95% of MOS

Substep 4.4: Determine Course Material Requirements

Overview

In this substep the analyst determines the New System's course material requirements. These requirements include training devices/equipment; petroleum, oils, and lubricants (POL); ammunition; and facilities. Figure 4.4-1 is an overview of this substep.

In Action Step 1 the analyst determines the training device/equipment requirements. He or she then determines their POL and ammunition consumption and the training facilities that will be required to house them.

The analyst determines course material requirements for each Proposed System course. The analyst must determine the type of materials required and the quantities required. He or she then estimates the cost of these materials for each course and determines a new cost element for the course's ATRM-159 report. The analyst uses these new course cost elements in Substep 4.8 to calculate the course cost.

This substep requires an extensive amount of on-site data collection. On-site data collection allows the analyst to determine more accurately the training devices/equipment, the hours operated, miles traveled, ammunition expended, facilities used, etc. The analyst should also be in contact with proponent school personnel who conduct Cost and Training Effectiveness Analyses (CTEA) and other forms of economic analyses.

This analysis focuses on the entire program of instruction (POI), that is, all files in the POI, not just system-specific ones. A POI file represents one unit of training time. When a POI file is scheduled and conducted, the associated training devices, training equipment, and facilities are considered unavailable for other uses. In actual practice and for the purpose of achieving optimum use of resources, the analyst may have to analyze each type of instruction and its associated resources. For example, a POI file has three hours of conference, one hour of demonstration, and eight hours of practical exercise 1. If the three hours of conference and one hour of demonstration are conducted in a traditional classroom facility, followed by eight hours in a special simulator facility, the simulator facility may be available to another class while the classroom facility is being used. In making the decision to break up a POI file, the analyst must consider training device/equipment maintenance requirements, instructional preparation, and student transportation.

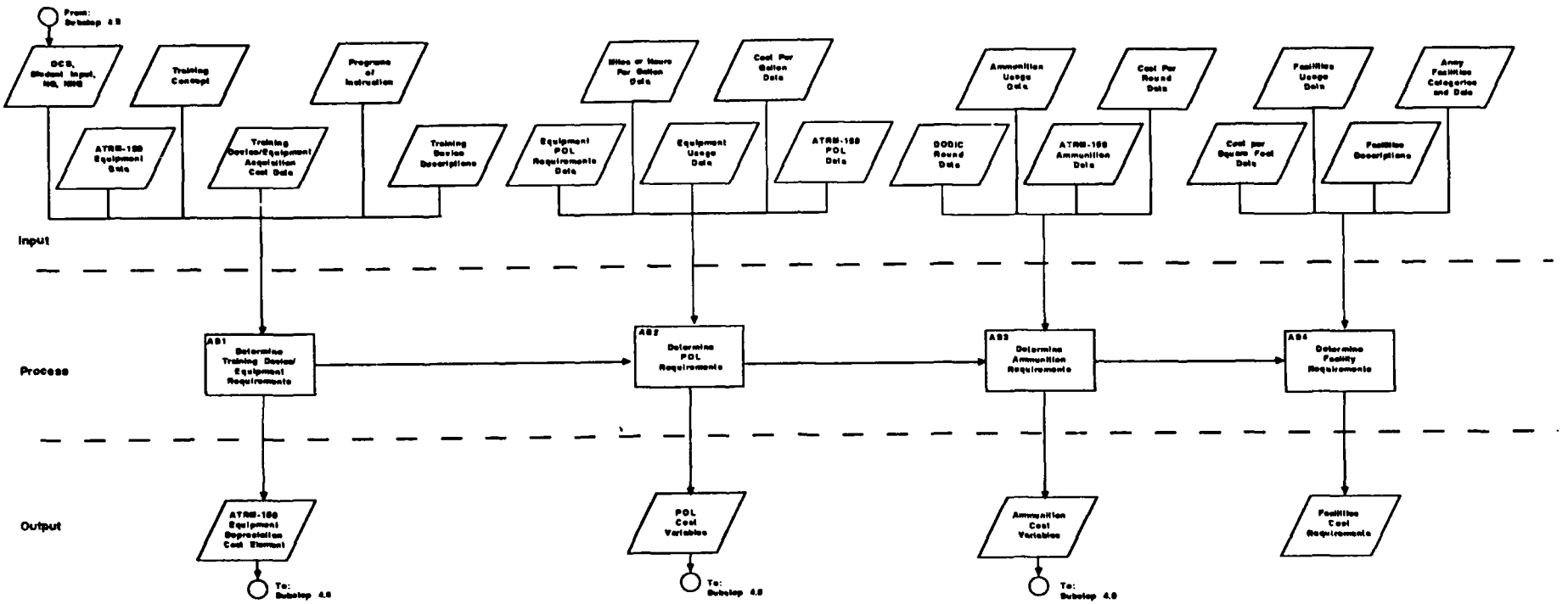

Figure 4.4-1. Overview of Substep 4.4, Determine Course Material Requirements.

Action Step 1: Determine Training Device/Equipment Requirements

Discussion

In this action step the analyst determines the New System's training device and training equipment requirements. The analyst uses the New System training concept from Substep 4.1 and the Proposed System courses from Substep 4.3. The analyst must determine which training devices/equipment will be used in each course and how many of them are required. The analyst then determines the cost of the training device/equipment and determines an adjusted ATRM-159 equipment depreciation cost element.

Procedures

1. **Determine Training Devices and Equipment.**
   - Obtain the training device/equipment strategy from the New System training concept (Substep 4.1).
   - List the training devices/equipment on Worksheet 4.4-1.
   - Identify the program of instruction (POI) in which the *training device/equipment is* used. Use the POI's Equipment Summary and Training Aid, Device, and Substitute Summary to determine whether any additional major training devices/equipment are required. Record these training devices/equipment on Worksheet 4.4-1.
   - If no training device/equipment strategy is available or if alternative strategies are being considered, obtain the Proposed System courses from Substep 4.3.
   - Obtain the POI from which each module of instruction was derived. Identify the training devices/equipment used.
   - Survey the training device sources listed in Table 4.4-1 and add applicable training devices to Worksheet 4.4-1.
   - Determine the student capacity of each training device/equipment in the form of a student-to-equipment (S/E) or a student-to-device (S/D) ratio. Determine the student-to-instructor (S/I) ratio for each training device/equipment.
2. **Determine Training Device/Equipment Usage.**
   - Record on Worksheet 4.4-2 the MOS/ASI, course number, optimum class size, annex number, file number, module title, types of instruction, hours, and groups for each Proposed System course (from Worksheet 4.3-3).

Table 4.4-1. Sources of Training Device Descriptions

1. DA Pam 310-12, Index and Description of Army Training Devices
2. TRADOC Pam 71-9, Catalog of TASO Training Devices
3. U.S. Army Comprehensive Plan for Training Devices
4. Instructional materials catalogs from proponent schools and Training and Audiovisual Support Centers (TASC)
5. Army Extension Training Information System (AETIS)
6. Training device experts and publications from the Army's Project Manager for Training Devices (PM TRADE)
7. Educational specialists in the proponent school's New System Training Officer (NSTO), Directorate of Training and Doctrine (DOTD), or training device support office
8. Manufacturers' literature describing new and fielded training devices
9. Other service training device catalogs, e.g., Directory of Naval Training Devices (Cog. 2 "0")

- For each annex and file, identify whether a training device and/or equipment will be used. Record the training devices/ equipment on Worksheet 4.4-2.
- Reconcile the types of instruction and groups to the S/E, S/D, and S/I ratios. If necessary, change the group sizes to coincide with the S/I ratios.
- Divide the optimum class size by the S/E or S/D ratio to determine the number of training devices/equipment required per annex and file. For example, if the optimum class size is 20 and the S/D ratio is four students per device, five training devices are required. Record the quantity required on Worksheet 4.4-2.
- Review the annex/file quantities to determine the greatest number of devices/equipment required for the class.
- List the training devices and the number required per class on Worksheet 4.4-3. List the training equipment on Worksheet 4.4-4.
- Obtain the student input (SI) and course length (CL) from Substep 4.5. If the course is conducted on a five-day, forty-hour schedule, divide the course length by 1.4 to obtain an academic course length (ACL).
- Determine the number of concurrent classes by applying the following formulas:

$$TC = \frac{SI}{OCS}$$

$$CCY = \frac{260}{ACL}$$

$$CC = \frac{TC}{CCY}$$

Where:

SI = Student Input
OCS = Optimum Class Size
TC = Total Classes Per Year
260 = Available Training Days Per Year
ACL = Academic Course Length (in days)
CCY = Consecutive Classes Per Year
CC = Concurrent Classes

NOTE

These equations can be modified for course and school differences in available training days, academic course lengths (e.g., formal school versus training center training day lengths), etc.

- Determine whether the number of concurrent classes can be decreased by staggering course starts, changing the order of course modules, or using idle devices or equipment. Develop course schedules similar to that shown in Figure 4.4-2 to model concurrent class convenings. This figure shows that by conducting the training that requires the Institutional Fire Mission Trainer in the first eight days, the training requirements of three classes can almost be met in the time span of one class.
- Round the results to the next whole number.
- Record the number of concurrent classes (CC) on Worksheets 4.4-3 and 4.4-4.
- Multiply the quantity required per class by the number of concurrent classes to obtain the total quantity required for the training devices/equipment. Record the total quantity required on Worksheets 4.4-3 and 4.4-4.

NOTE

This modeling technique is optional. The analyst should use it when a course requires many class convenings. Many creative opportunities exist to reduce the total requirements for training devices and equipment. For example, a scheduling bottleneck could be alleviated through the development of an inexpensive part-task trainer or through acquisition of less expensive subsystems. Small sequence changes in independent course modules, double-shift training, or the use of round-robin training techniques can often lead to significant reductions in training device and equipment requirements.

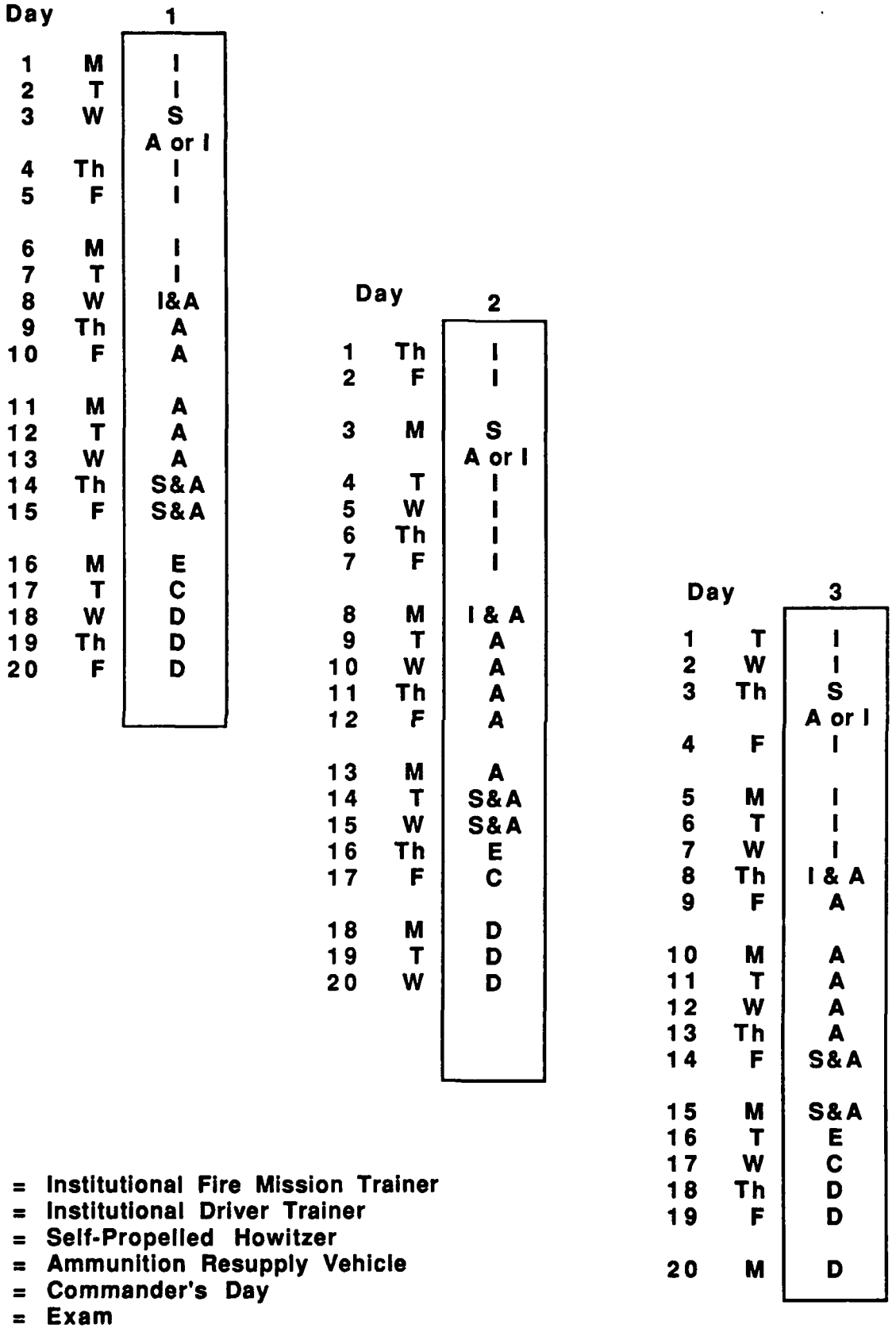

Figure 4.4-2. Sample Optimum Course Schedule.

3. **Determine Training Device/Equipment Costs.**

   - If the training device is included in the System Training Plan (STRAP), contact the New System Training Office (NSTO) or the TRADOC System Manager (TSM) to obtain the baseline cost estimate (BCE).
   - If a BCE does not exist, contact the Training Aids Services Offices (TASO) or TSM to obtain a rough cost estimate. Review the New System's Cost and Operational Effectiveness Analysis (COEA) for training device cost estimates.
   - If a cost estimate does not exist or the training device is notional, generate an estimate. If time and resources allow, contact PM TRADE for a training device cost estimate. If time and resources do not allow, use comparability analysis and SMEs to identify similar training devices and their acquisition costs. Consult the Armywide Devices Automated Management (ADAM) system, which is an automated data base of Army training devices, their locations, and their acquisition costs. This system is maintained by the Army Training Support Center (ATSC), Ft. Eustis, VA, and is available at every Training and Audiovisual Support Center (TASC).
   - Enter the training device cost per unit on Worksheet 4.4-3. Multiply the cost per unit by the total quantity required to obtain the total cost per training device.
   - Add the training device costs to obtain the Total Course Training Device Cost (TCTDC).
   - Obtain a baseline cost estimate (BCE) from the NSTO, the TSM, or the New System's program office for each piece of equipment.
   - Enter the cost per unit on Worksheet 4.4-4. Multiply the cost per unit by the total quantity required to obtain the total cost per training equipment.
   - Add the equipment costs to obtain the Total Course Training Equipment Cost (TCTEC).
   - Obtain the proponent school's equipment data report (Form 811-R) from the ATRM-159 program office. Form 811-R lists the current value of the equipment used by each course. Obtain from the proponent school the current value of each piece of equipment that is incorporated in the course's total equipment value.

- Obtain the course's comparable ATRM-159 report and locate the course's equipment depreciation cost element (Line 5, column t). Verify that the following formula was used to calculate the equipment depreciation cost element:

$$EQPA = \frac{CEV \times DF}{NG}$$

Where:

EQPA	=	Equipment Procurement, Army
CEV	=	Current Equipment Value (as reported on Form 811-R)
NG	=	Norm Grads (Equivalent Grads)
DF	=	Depreciation Factor (Usually 10%)

- Delete the current value of the Predecessor System's equipment and training devices. Use the following formula to calculate an adjusted equipment cost element:

$$AEQPA = \frac{(CEV - PEV)\ DF}{NG}$$

Where:

AEQPA	=	Adjusted Equipment Procurement, Army
CEV	=	Current Equipment Value
PEV	=	Predecessor System Equipment Value
DF	=	Depreciation Factor
NG	=	Norm Grads

- From Substep 4.5, obtain the norm grads (NG) and new norm grads (NNG). Use the following formula to determine a new ATRM-159 equipment depreciation cost element:

$$NEQPA = AEQPA \times \frac{NG}{NNG} + \frac{(TCTDC + TCTEC)DF}{NNG}$$

Where:

NEQPA	=	New Equipment Procurement, Army
AEQPA	=	Adjusted Equipment Procurement, Army
NG	=	Norm Grads
NNG	=	New Norm Grads
TCTDC	=	Total Course Training Device Cost
TCTEC	=	Total Course Training Equipment Cost
DF	=	Depreciation Factor

- Use the NEQPA in the course cost calculations in Substep 4.8.

Procedure 1 Example

A new Future Armored Combat System (FACS) is proposed to replace the Army's M1 main battle tank. New MOS 19X is proposed to be the New System's operator.

The analyst obtains the New System's training concept from Substep 4.1. The concept's training device/equipment strategy identifies the need for a FACS Conduct of Fire Trainer (COFT) and a FACS Driver Trainer Mock Up, as well as a requirement that some files be instructed in operational equipment.

The analyst obtains the Proposed System course 19X10-OSUT from Substep 4.3. Much of this new course is estimated from the existing 19K10-OSUT. The analyst obtains the 19K10-OSUT POI and reviews the Equipment Summary and Training Aid, Device, and Substitute Summary for additional training device/equipment requirements. He or she then reviews the training device sources identified on Table 4.4-1, but finds no additional training devices. A completed Worksheet 4.4-1 is shown in Figure 4.4-3.

Procedure 2 Example

The analyst obtains the Proposed System course from Worksheet 4.3-3. He or she evaluates each annex and file and indicates training device and/or equipment usage. The analyst then reconciles types of instruction and group sizes to conform with the student training capacities of the training devices/equipment. A completed worksheet is shown in Figure 4.4-4.

The analyst reviews all 19X10-OSUT annexes and files to determine the greatest number of training device/equipment requirements. As shown in Figure 4.4-5, thirteen FACS COFTs are required to conduct one class. Because of a two-shift training day, only one concurrent class is required. As shown in Figure 4.4-6, similar results are attained for training equipment.

Procedure 3 Example

The analyst obtains baseline cost estimates (BCE) for the training devices from PM TRADE and obtains BCE for the FACS from the program office. He or she then calculates total course training device and equipment costs as shown in Figures 4.4-3 and 4.4-4, respectively.

Next, the analyst obtains Form 811-R (Equipment Data) from the ATRM-159 program office. This form lists the current value of equipment used by the course as $16.9 million. The analyst obtains the ATRM-159 Report and determines that the Equipment Procurement, Army (EQPA) cost element (line 5, column t) is $1,757.

WORKSHEET 4.4-1

Use this worksheet to list training devices/equipment.

MOS/ASI: 19X **Course Number:** 19X10 - OSUT

Training Devices	Training Equipment
FACS Conduct of Fire Trainer (COFT)	Future Armored Combat System (FACS)
M179 Telfare Device	Launcher, Grenade M250
FACS Driver Trainer Mock Up	Machinegun Cal .50 M2
	Machinegun 7.62, M240

Figure 4.4-3. Example of a Proposed System course's training devices and equipment.

WORKSHEET 4.4-2

Use this worksheet to record the use of training devices/equipment in Proposed System courses.

MOS/ASI: 19X Course Number: 19X10 - OSUT Optimum Class Size: 160

Annex Number	File Number	Module Title	Type of Instruction	Hours	Groups	Training Device/ Equipment	Quantity Required
K	EI507	Drive FACS day/night (basic)	PE1	7.3	53	FACS	13
	EI508	Drive FACS day/night (advanced)	PE1	7.9	53	FACS	13
	EI509	Gunnery Proficiency	PE1	2.0	53	COFT	13
	EI510	Tactical Driving Stabilization Gunnery	PE1	1.5	53	FACS	13

Figure 4.4-4. Example of a Proposed System course's training device/equipment requirements by annex and file.

WORKSHEET 4.4-3

Use this worksheet to determine a total course training device cost.

MOS/ASI: 19X **Course Number:** 19X10 - OSUT

Training Device	Quantity Required Per Class	Concurrent Classes	Total Quantity Required	Cost Per Unit	Total Cost Per Training Device
FACS COFT	13	1	13	$8 Million	$104 Million
FACS Driver Trainer Mock Up	13	1	13	$.5 Million	$6.5 Million
			Total Course Training Device Cost		$110.5 Million

Figure 4.4-5. Example of a Proposed System course's training device costs.

WORKSHEET 4.4-4

Use this worksheet to determine a total course training equipment cost.

MOS/ASI: 19X **Course Number:** 19X10 - OSUT

Equipment Name	Quantity Required Per Class	Concurrent Classes	Total Quantity Required	Cost Per Unit	Total Cost Per Training Equipment
FACS Main Battle Tank-Full Tracked	13	-	13	$2.1 million*	$27.3 million

* 1995 cost estimate

Total Course Training Equipment Cost	$27.3 million

Figure 4.4-6. Example of a Proposed System course's training equipment costs.

Procedure 3 Example (continued)

The analyst calculates the EQPA cost element as follows:

$$EQPA = \frac{\$16.9 \text{ mil} \times .10}{960}$$

$$= \$1,757$$

The Property Book at the proponent school shows that $13.5 million of the current equipment value (CEV) is dedicated to the Predecessor System. The analyst calculates an Adjusted Equipment Procurement, Army (AEQPA):

$$AEQPA = \frac{(\$16.9 \text{ mil} - \$13.5 \text{ mil}) .10}{960}$$

$$= \$354$$

The analyst obtains a new norm grad of 1,620 from Substep 4.5. He or she then calculates a New Equipment Procurement, Army (NEQPA):

$$NEQPA = 354 \times \frac{960}{1,620} + \frac{(\$110.5 \text{ mil} + \$27.3 \text{ mil}) .10}{1,620}$$

$$= 209.8 + 2367.3$$

$$= \$2,577.1$$

The analyst substitutes this new cost element for the old value in Substep 4.8.

Action Step 2: Determine Petroleum, Oils, and Lubricants (POL) Requirements

Discussion

In this action step the analyst uses the Proposed System courses from Substep 4.3 to determine the amount of petroleum, oils, and lubricants (POL) required by the training equipment identified in Action Step 1. The analyst studies each annex and file to determine the miles driven or hours operated for each piece of equipment. The focus of this analysis is on each course's annexes and files. The analyst then determines the cost of the POL and calculates an adjusted ATRM-159 overhead operations/maintenance non-personnel (OHNP) cost element.

Procedures

1. **Determine the Consumption of Petroleum, Oils, and Lubricants.**

   - For each Proposed System course, identify the course modules that use pieces of training equipment that consume POL.
   - Record on Worksheet 4.4-5 the annex number, file number, module title, equipment name, and equipment quantity.
   - Consult school personnel familiar with existing, comparable training to estimate the miles each piece of equipment is driven or the hours it is operated. Use installation maps, historical records, and, if necessary, actual odometer readings to verify all estimates. Record the miles or hours on Worksheet 4.4-5.
   - Multiply the equipment quantity by the miles driven or hours operated to determine the total miles or hours. Record the total miles or hours on Worksheet 4.4-5.
   - Record the pieces of equipment on Worksheet 4.4-6.
   - Obtain the types of POL that existing pieces of equipment use from operator's manuals or subject-matter experts. For new pieces of equipment, obtain this information from the Required Operational Capability (ROC) or other requirements documents. Record the POL types on Worksheet 4.4-6.

- Obtain the miles per gallon (MPG), gallons per mile (GPM), or gallons per hour (GPH) for existing pieces of equipment from the operator's manual, the Army Modernization Information Memorandum (AMIM), the Sample Data Collection (SDC) system, or the "reference" book from the weapon system's branch (e.g., Armor Reference Book). For new pieces of equipment, obtain an estimate from the ROC, other requirements documents, or the New System program office.
- If a POL consumption estimate is not available for the new pieces of equipment, use the graphing technique shown in Figure 4.4-7. If the piece of equipment is tracked, use the estimated weight (in tons) to determine the gallons per mile. Use a similar graph for wheeled vehicles, aircraft, and generators (which consume fuel by operating hour).
- Record the miles or hours per class on Worksheet 4.4-6. Multiply the miles or hours by the gallons per mile or hour (GPM, MPG, or GPH) to determine the total gallons per class.

2. **Determine POL Costs.**
   - Contact the Directorate of Industrial Operations (DIO) at the course's installation and obtain the cost per gallon of each POL type. Record the cost on Worksheet 4.4-6.
   - Multiply the cost per gallon by the total gallons per class to obtain the POL cost per class.
   - From Substep 4.5, obtain the optimum class size (OCS) and student input. Divide the student input by the OCS to obtain the class frequency (CF). Enter the class frequency on Worksheet 4.4-6.
   - Multiply the POL cost per class by the class frequency to obtain the course POL cost per equipment. Record the POL costs on Worksheet 4.4-6.
   - Add the POL costs for each piece of equipment to obtain the total course POL costs.
   - Obtain TRADOC Form 806-R. If the course has POL expenses ("Code D") in column f ("All Other 220-250"), contact the proponent school and determine whether the expenses include Predecessor System POL. If the expenses include Predecessor System POL, subtract these expenses from the OMA total. On TRADOC Form 806-R, total the OMA expenses to obtain the course's adjusted total OMA (ATOMA).

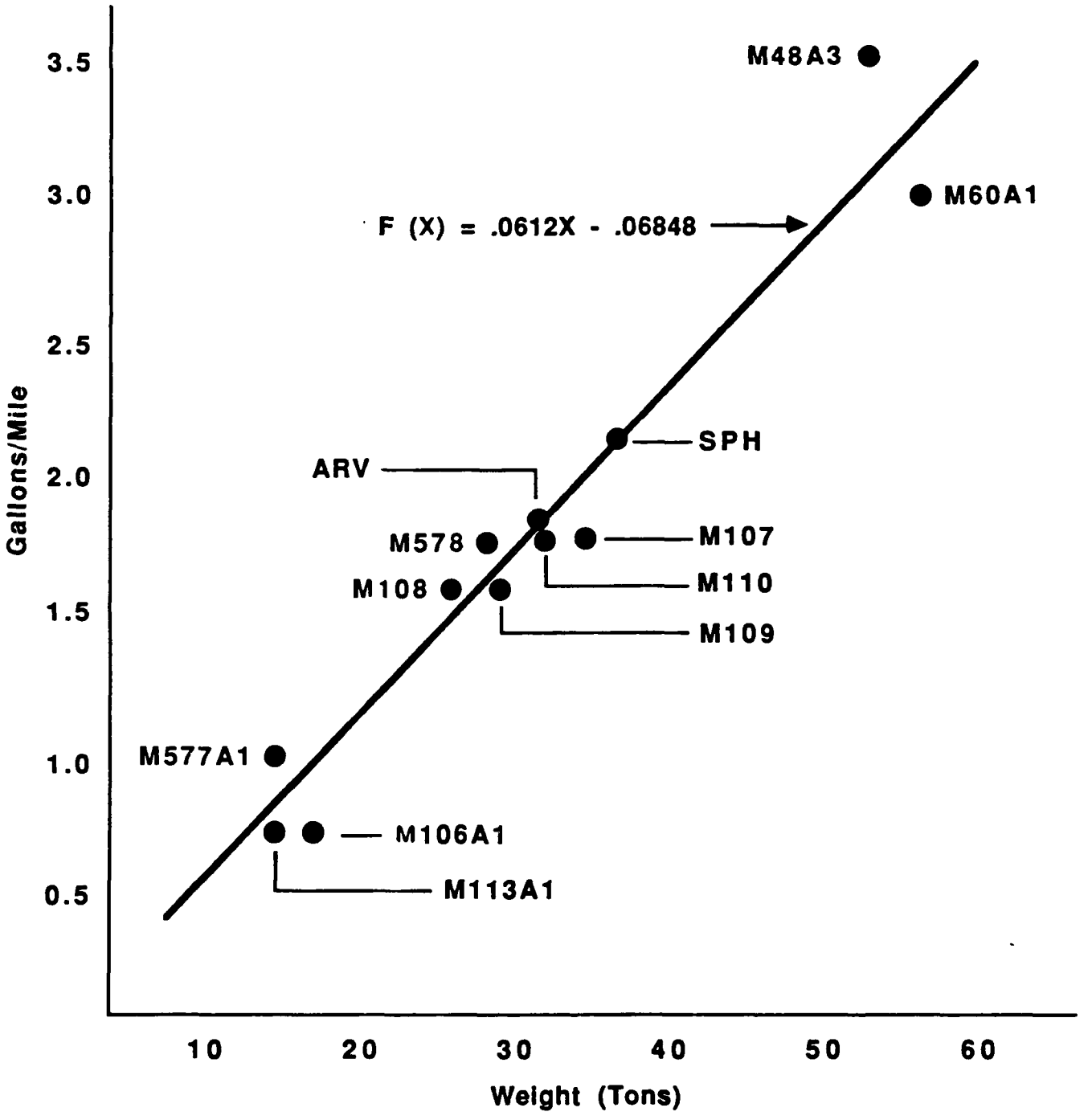

Figure 4.4-7. Sample Graph for estimating tracked vehicle fuel consumption.

- Obtain the course's ATRM-159 report and locate the course's overhead operations/maintenance non-personnel (OHNP) cost element (Line 3, column s).
- From Substep 4.5, obtain the course's norm grads (NG) and new norm grads (NNG). Determine an adjusted ATRM-159 OHNP cost element by using the following equation:

$$AOHNP = \frac{ATOMA + TCPC}{NNG}$$

Where:

AOHNP	=	Adjusted Overhead Operations/Maintenance Non-Personnel
ATOMA	=	Adjusted Total Operations Maintenance, Army
TCPC	=	Total Course POL Cost
NNG	=	New Norm Grads

- Use the AOHNP in the course cost calculations in Substep 4.8.

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Procedure 1 Example

The analyst obtains and reviews Worksheet 4.4-2. On Worksheet 4.4-5, the analyst enters course modules that use pieces of training equipment that consume POL.

The analyst visits the course site and uses the odometer on a privately owned vehicle (POV) to determine the distances between the motor pool and all ranges. The analyst then consults course personnel about when and to where each piece of equipment is driven. He or she adds this information to Worksheet 4.4-5, as shown in Figure 4.4-8.

The analyst enters each different piece of equipment on Worksheet 4.4-6. He or she uses the Required Operational Capability (ROC) to determine POL types and gallons per hour. The analyst adds these values to Worksheet 4.4-6. He or she then obtains the total miles per class from Worksheet 4.4-5 and, as shown in Figure 4.4-9, calculates total gallons per class.

Procedure 2 Example

The analyst contacts the Directorate of Industrial Operations and obtains a cost per gallon of 93 cents for DF-1 fuel. The analyst adds this cost to Worksheet 4.4-6 and multiplies this cost by the total gallons per class to obtain a POL cost per class of $19,585.

The analyst determines a class frequency of 3 by dividing the student input (1,620) by the optimum class size (160). He or she then determines a total POL cost per equipment of $195,850, as shown in Figure 4.4-9.

The analyst obtains TRADOC Form 806-R from the MOS Course Cost Program Office. The POL expenses indicated for the course are $148K. The analyst contacts course personnel and determines that all of these funds are attributable to the Predecessor System. He or she subtracts these costs from the total OMA to obtain an adjusted total of $109K.

The analyst then obtains the new norm graduates (NNG) of 1,620 from Substep 4.5 and determines a New Operations/Maintenance Non-Personnel (OHNP) cost element:

$$\text{OHNP} = \frac{\$109\text{K} + \$196\text{K}}{1620}$$

$$= \$188$$

The analyst substitutes this new cost element for the old value in Substep 4.8.

WORKSHEET 4.4-5

Use this worksheet to determine POL consumption.

MOS/ASI: 19X **Course Number:** 19X10 - OSUT

Annex Number	File Number	Module Title	Equipment Name	Equipment Quantity Required	Miles or Hours	Total Miles or Hours
M	FTXLOI	Tanker's Field Exercise	FACS	13	54 hours*	702 hours

* 50 hours are instructed after normal duty day; they are not counted in the course length.

Figure 4.4-8. Example of a Proposed System course's POL requirements.

WORKSHEET 4.4-6

Use this worksheet to determine POL costs.

MOS/ASI: 19X **Course Number:** 19X10 - OSUT

Equipment Name	POL Type	Miles or Hours per Class	GPH, GPM, or MPG	Total Gallons per Class	Cost Per Gallon	POL Cost per Class	Class Frequency	Total POL Cost per Equipment
FACS	DF-1	702 hours	30 GPH	21,060	$.93	$19,585	10	$195,850

Figure 4.4-9. Example of a Proposed System course's POL costs.

Action Step 3: Determine Ammunition Requirements

Discussion

In this action step the analyst uses the Proposed System courses from Substep 4.3 to determine the ammunition requirements for the training equipment determined in Action Step 1.

The analyst studies each annex and file to determine whether ammunition must be expended for training purposes. The analyst determines the type of rounds and the quantity of rounds required. Each student will require ammunition and the class will require ammunition for demonstrations. The analyst obtains a cost per type of round and determines a total course ammunition cost. He or she then uses this cost to determine an adjusted ATRM-159 ammunition cost element.

Procedures

1. **Determine Ammunition Usage.**
   - For each annex and file that uses training equipment (as identified in Action Step 1), record on Worksheet 4.4-7 the annex number, file number, module title, and equipment name.
   - Determine the types of ammunition required by each annex and file. Base this estimate on the types of ammunition that the existing course uses and the ammunition requirements described in the System Training Plan (STRAP).
   - Identify the Department of Defense Identification Code (DODIC) for each type of ammunition. Record the DODIC used in each annex and file on Worksheet 4.4-7.
   - Estimate the number of rounds required for each student and each class. Base this estimate on the amount of ammunition that the existing course uses and the ammunition requirements described in the STRAP.
2. **Determine Ammunition Cost.**
   - List each DODIC on Worksheet 4.4-8.
   - Obtain the National Stock Number (NSN) for each DODIC from the DoD Ammo Catalog (Ammo 123), firing tables, or any other available references. Record the NSNs on Worksheet 4.4-8.

- Use the Army Master Data File (AMDF) or Supply Bulletin (SB) 700-20 to determine the cost of each DODIC ammunition round. Record the cost per round in column j.
- For each DODIC, total the student and class ammunition requirements from Worksheet 4.4-7 and record these sums in columns c and f of Worksheet 4.4-8.
- Obtain the student input from Substep 4.5 and record it in column d.
- Multiply the ammunition required per student (column c) by the student input (column d) to obtain the total student ammunition requirement (column e).
- Divide the student input by the optimum class size (from Substep 4.5) to obtain class frequency. Multiply the ammunition required per class (column f) by the class frequency (column g) to obtain the total class ammunition requirement (column h).
- Add the total student ammunition requirement (column e) and the total class ammunition requirement (column h) to obtain the total ammunition requirement (column i).
- Multiply the total ammunition requirement (column i) by the cost per round (column j) to obtain the total cost per DODIC (column k).
- Sum the total DODIC costs (column k) to obtain the Total Course Ammunition Cost (TCAC).
- Use the following formula to determine a new ATRM-159 ammunition cost element:

$$\text{NAMMOPA} = \frac{\text{TCAC}}{\text{NNG}}$$

Where:

NAMMOPA	=	New Ammunition Other Procurement, Army
TCAC	=	Total Course Ammunition Cost
NNG	=	New Normalized Graduates

- Use the NAMMOPA in the course cost calculations in Substep 4.8.

Procedure 1 Example

The analyst reviews Worksheet 4.4-2. He or she enters course modules that use pieces of training equipment on Worksheet 4.4-7. The analyst then reviews each module further to determine whether any ammunition is fired.

The analyst identifies whether the ammunition types and their Department of Defense Identification Code (DODIC) are on Worksheet 4.4-7. The analyst evaluates the Predecessor System course to determine the amount of ammunition required per course module. As shown in Figure 4.4-10, the analyst adds these ammunition requirements to Worksheet 4.4-7.

Procedure 2 Example

The analyst records each unique DODIC on Worksheet 4.4-8. He or she obtains the National Stock Number from the DoD Ammo Catalog and the cost of each DODIC ammunition round from the Army Master Data File (AMDF). The analyst obtains the total student and class ammunition requirements from Worksheet 4.4-7 and adds them to Worksheet 4.4-8. He or she then obtains the student input of 160 from Substep 4.5 and multiplies this number by the ammunition required per student to obtain the total student ammunition requirement (column e).

The analyst multiplies the class frequency by the ammunition required per class to obtain the total class ammunition requirement (column h). He or she adds the total student and class ammunition requirements to determine the total ammunition requirement (column i). The analyst multiplies this requirement by the cost per round to determine the total cost per DODIC (column k). He or she then adds the DODIC costs to obtain a total course ammunition cost (TCAC) of $1,027 million. Figure 4.4-11 is a completed Worksheet 4.4-8.

The analyst uses the following formula to determine a new ATRM-159 ammunition cost element:

$$\text{NAMMOPA} = \frac{\$1{,}027\ \text{Mil}}{1620}$$

$$= \$634$$

The analyst substitutes this new cost element for the old value in Substep 4.8.

WORKSHEET 4.4-7

Use this worksheet to record the use of ammunition in Proposed System courses.

MOS/ASI: 19X **Course Number:** 19X10 - OSUT

Annex Number	File Number	Module Title	Equipment Name	DODIC	Item Description	Ammunition Requirement	
						Per Student	Per Class
I	CI75005, 53004	Individual Tactical Training	M-16	A-071	5.56mm Ball Ammo M193	54	-
	BT21-114		M-16	A-080	5.56mm Blank Ammo M200	40	-
	BT21-114		Coaxial Weapon	A-112	7.62 Linked Blank NATO M82	40	-
	EI 909,908		Coaxial Weapon	A-131	7.62 NATO Linked Ball M80	400	3,200
			Main Gun	C-511	105mm TP-T M456 or M490 Canon Shell	2	-
M	EI909	Tanker's Field Exercise	Main Gun	C-520	105mm APDS (SABOT)	6	-

Figure 4.4-10. Example of a Proposed System course's training ammunition requirements.

WORKSHEET 4.4-8

Use this worksheet to determine a total course ammunition cost.

MOS/ASI: 19X **Course Number:** 19X10-OSUT

DODIC (a)	National Stock Number (b)	Ammunition Required Per Student (c)	Student Input (d)	Total Student Ammunition Requirement (e)	Ammunition Required Per Class (f)	Class Frequency (g)	Total Class Ammunition Requirement (h)	Total Ammunition Requirement (i)	Cost Per Round (j)	Total Cost Per DODIC (k)
A-071	1305-01-015-6185	54	160	8,640	-	3	25,920	25,920	$.24	6,220.80
A-080	1305-00-182-3217	40	160	6,400	-	3	19,200	19,200	.13	2,496.00
A-112	1305-00-882-5677	40	160	6,400	-	3	19,200	19,200	.19	3,648.00
A-131	1305-00-892-2150	400	160	64,000	3,200	3	192,000	195,200	.28	54,656.00
C-511	1315-01-114 9491	2	160	320	-	3	960	960	193.00	185,280.00
C-520	1315-01-041-2320	6	160	960	-	3	2,880	2,880	269.00	774,720.00
								Total Course Ammunition Cost (TCAC)		$1,027,020.80

Figure 4.4-11. Example of a Proposed System Course's ammunition costs.

Action Step 4: Determine Facility Requirements

Discussion

In this action step the analyst uses the Proposed System courses from Substep 4.3 and the training device/equipment requirements from Action Step 1 to determine facility requirements. The analyst must determine the type of facilities that will be required for each course module. The analyst determines the total square foot requirements for each type of facility. The analyst then determines a facility cost for each course.

The analyst does not use the facility cost to adjust the course's ATRM-159 report as he or she did in previous action steps. The facility cost is a stand-alone result that the analyst can use to compare the Predecessor System's facility cost with those of the Proposed System(s). The analyst can also compare alternative Proposed System equipment designs or training device/equipment strategies.

Procedures

1. **Determine Facility Usage.**
   - For each Proposed System course, record on Worksheet 4.4-9 the MOS/ASI, course number, optimum class size, annex number, file number, module title, type of instruction, hours, groups, training device/equipment, and quantity required.
   - For each annex and file, identify the type of facility that is required. Record the appropriate facility category code and unit of measure code (construction use) from AR 415-28, *Department of the Army Facility Classes and Construction Categories (Category Codes).*
   - Use the facility summary from existing POIs to identify candidate facility types. Use design descriptions of proposed training devices and equipment to determine special electrical, computer support, maintenance support, or other facility design considerations.
2. **Determine Facility Space Requirements.**
   - Identify the unique facility categories listed on Worksheet 4.4-9 and record them on Worksheet 4.4-10. For each facility code, record the unit of measure code, training device/equipment, and quantity required. The training device/equipment quantity is the greatest quantity required by one annex or file. The quantity is not the total of all the file quantities.

- Use AR 415-28 or the facility summary from the POIs to identify the facility description. Record the description on Worksheet 4.4-10.
- Use TRADOC Pam 415-1, *Winning Approval for Construction and Renovation Needs of U.S. Army Service Schools* (Chapter 2, Appendix D and G) to estimate the facility space requirements. Use the rule-of-thumb method, the analytical method, or the scaled layout method. On Worksheet 4.4-10, record the total square feet required.

NOTE

The total square feet that the analyst enters on Worksheet 4.4-10 must reflect the requirements for all class convenings, not just for one class. Use the procedures in TRADOC Pam 415-1, Appendix G, or a derivative of those in Action Step 1, Procedure 2, to determine the facility requirements of concurrent classes.

- Obtain the estimated cost per square foot from the Directorate of Engineering and Housing (DEH), which is usually in the Master Planning Branch or a similar office that is responsible for facility planning at the installation at which the course will be taught. Record the cost on Worksheet 4.4-10.
- Multiply the total square feet required by the cost per square foot to obtain the total facility cost.
- Add the total facility costs to obtain the total course facility cost.

Procedure 1 Example

This example is a continuation of the Proposed System course from the examples for Action Step 1. The analyst adds the following elements for the Proposed System course to Worksheet 4.4-9:

- MOS/ASI
- Course Number
- Optimum Class Size
- Annex Number
- File Number
- Module Title
- Type of Instruction
- Hours
- Groups
- Training Device/Equipment
- Quantity Required

The analyst identifies the type of facility for each annex and file. He or she then obtains the facility category code and unit of measure code from AR 415-28. Figure 4.4-12 shows a completed Worksheet 4.4-2.

Procedure 2 Example

The analyst lists each unique facility code on Worksheet 4.4-9 and records it on Worksheet 4.4-10. He or she also includes the unit of measure code, training device/equipment, and quantity required. The analyst uses AR 415-28 to determine the facility description.

The analyst uses the analytical method to determine the total square foot requirement of 9,800 for 13 conduct of fire trainers. For this type of facility, the Master Planning Branch at the course's installation estimated a cost per square foot of $125. The analyst obtains cost estimates for the other facilities from this office and enters them on Worksheet 4.4-10. He or she obtains a total course facility cost of $6.05 million by adding each of the facility costs. Figure 4.4-13 is a completed Worksheet 4.4-10.

WORKSHEET 4.4-9

Use this worksheet to record the use of training facilities in Proposed System courses.

MOS/ASI: 19X **Course Number:** 19X10-OSUT

Annex Number	File Number	Module Title	Type of Instruction	Hours	Groups	Training Device/ Equipment	Quantity Required	Facility Category Code	Unit of Measure Code
K	EI507	Drive FACS day/night (Basic)	PEI	7.3	53	FACS	13	179 55	1 each
	EI508	Drive FACS day/night (Advanced)	PEI	7.9	53	FACS	13	179 56	1 each
	EI509	Gunnery Proficiency	PEI	2.0	53	ICOFT	13	171 82	Square Feet
	EI510	Tactical Driving Stabilization Gunnery	PEI	1.5	53	FACS	13	179 33	1 each

Figure 4.4-12. Example of a Proposed System course's training facility requirements.

WORKSHEET 4.4-10

Use this worksheet to record the square foot and facility cost requirements of Proposed System courses.

MOS/ASI: 19X Course Number: 19X10-OSUT

Facility Category Code	Facility Description	Unit of Measure Code	Training Device/ Equipment	Quantity Required	Total Square Feet Required	Cost Per Square Foot	Total Facility Cost
179 55	Driver's Training Course I	1 each	FACS	13	NA	NA	$.5 MIL
179 56	Driver's Training Course II	1 each	FACS	13	NA	NA	$.5 MIL
171 82	Building for 13 Conduct of Fire Trainers (COFT)	Square Feet	COFT	13	9800 sq. ft.	$125.	$1.25 MIL
179 33	FACS Gunnery Course	1 each	FACS	13	NA	NA	$3.8 MIL
					Total Course Facility Cost		$6.05 MIL

Figure 4.4-13. Example of a Proposed System Course's facility costs.

SUBSTEP 4.4
WORKSHEETS

WORKSHEET 4.4-1

Use this worksheet to list training devices/equipment.

Training Devices	Training Equipment

WORKSHEET 4.4-2

Use this worksheet to record the use of training devices/equipment in Proposed System courses.

MOS/ASI:_____ **Course Number:** _____ **Optimum Class Size:**_____

Annex Number	File Number	Module Title	Type of Instruction	Hours	Groups	Training Device/ Equipment	Quantity Required

WORKSHEET 4.4-3

Use this worksheet to determine a total course training device cost.

MOS/ASI:_____ **Course Number:**_____

Training Device	Quantity Required Per Class	Concurrent Classes	Total Quantity Required	Cost Per Unit	Total Cost Per Training Device

	Total Course Training Device Cost

WORKSHEET 4.4-4

Use this worksheet to determine a total course training equipment cost.

MOS/ASI:_____ **Course Number:**_____

Equipment Name	Quantity Required Per Class	Concurrent Classes	Total Quantity Required	Cost Per Unit	Total Cost Per Training Equipment
				Total Course Training Equipment Cost	

WORKSHEET 4.4-5

Use this worksheet to determine POL consumption.

MOS/ASI:_____ **Course Number:**_____

Annex Number	File Number	Module Title	Equipment Name	Equipment Quantity Required	Miles or Hours	Total Miles or Hours

WORKSHEET 4.4-6

Use this worksheet to determine POL costs.

MOS/ASI:_____ **Course Number:** _____

Equipment Name	POL Type	Miles or Hours per Class	GPH, GPM, or MPG	Total Gallons per Class	Cost Per Gallon	POL Cost per Class	Class Frequency	Total POL Cost per Equipment

WORKSHEET 4.4-7

Use this worksheet to record the use of ammunition in Proposed System courses.

MOS/ASI:_____ **Course Number:**_____

Annex Number	File Number	Module Title	Equipment Name	DODIC	Item Description	Ammunition Requirement	
						Per Student	Per Class

WORKSHEET 4.4-8

Use this worksheet to determine a total course ammunition cost.

MOS/ASI:_____ **Course Number:**_____

DODIC (a)	National Stock Number (b)	Ammunition Required Per Student (c)	Student Input (d)	Total Student Ammunition Requirement (e)	Ammunition Required Per Class (f)	Class Frequency (g)	Total Class Ammunition Requirement (h)	Total Ammunition Requirement (i)	Cost Per Round (j)	Total Cost Per DODIC (k)

	Total Course Ammunition Cost (TCAC)

WORKSHEET 4.4-9

Use this worksheet to record the use of training facilities in Proposed System courses.

MOS/ASI:_____ **Course Number:** _____

Annex Number	File Number	Module Title	Type of Instruction	Hours	Groups	Training Device/ Equipment	Quantity Required	Facility Category Code	Unit of Measure Code

WORKSHEET 4.4-10

Use this worksheet to record the square foot and facility cost requirements of Proposed System courses.

MOS/ASI: ______________ **Course Number:** ________________

Facility Category Code	Facility Description	Unit of Measure Code	Training Device/ Equipment	Quantity Required	Total Square Feet Required	Cost Per Square Foot	Total Facility Cost

Total Course Facility Cost

Substep 4.5: Determine Course Resource Data

Overview

In this substep the analyst determines course data elements that he or she will use in subsequent TRRA substeps to calculate course resource and cost requirements. The analyst must determine these data for the Predecessor System, Baseline Comparison System (BCS), and Proposed System courses of instruction. Figure 4.5-1 is an overview of this substep.

This substep plays an important role in organizing, controlling, and focusing attention on these critical TRRA data. Action Step 1 provides procedures for identifying and recording known course resource data. The training concept from Substep 4.1 provides information about the New System courses. It also provides information about the Predecessor System courses and existing courses that the New System's design does not affect. In this action step the analyst obtains the student input, course length, and one-time instructor contact hours (ICH) and converts them to the appropriate unit of measure.

In Action Step 2 the analyst determines other course resource data through the use of comparability analysis. The analyst performs this action step when the New System requires a new course or when an existing Army or non-Army course lacks sufficient course data elements for the subsequent cost and resource calculations. The analyst evaluates comparable courses and selects the course most like the course under evaluation. He or she uses the comparable course to estimate the course attrition rate, TRADOC Management and Engineering Activity (TRAMEA) course type, modal grade, and optimum class size. The analyst also uses the comparable course's ATRM-159 report to determine course costs.

NOTE

In this substep the analyst finalizes and documents nearly all of the cost and resource data needed to perform subsequent calculations. The analyst should use the worksheet completed during this substep as the only source of course data in these calculations.

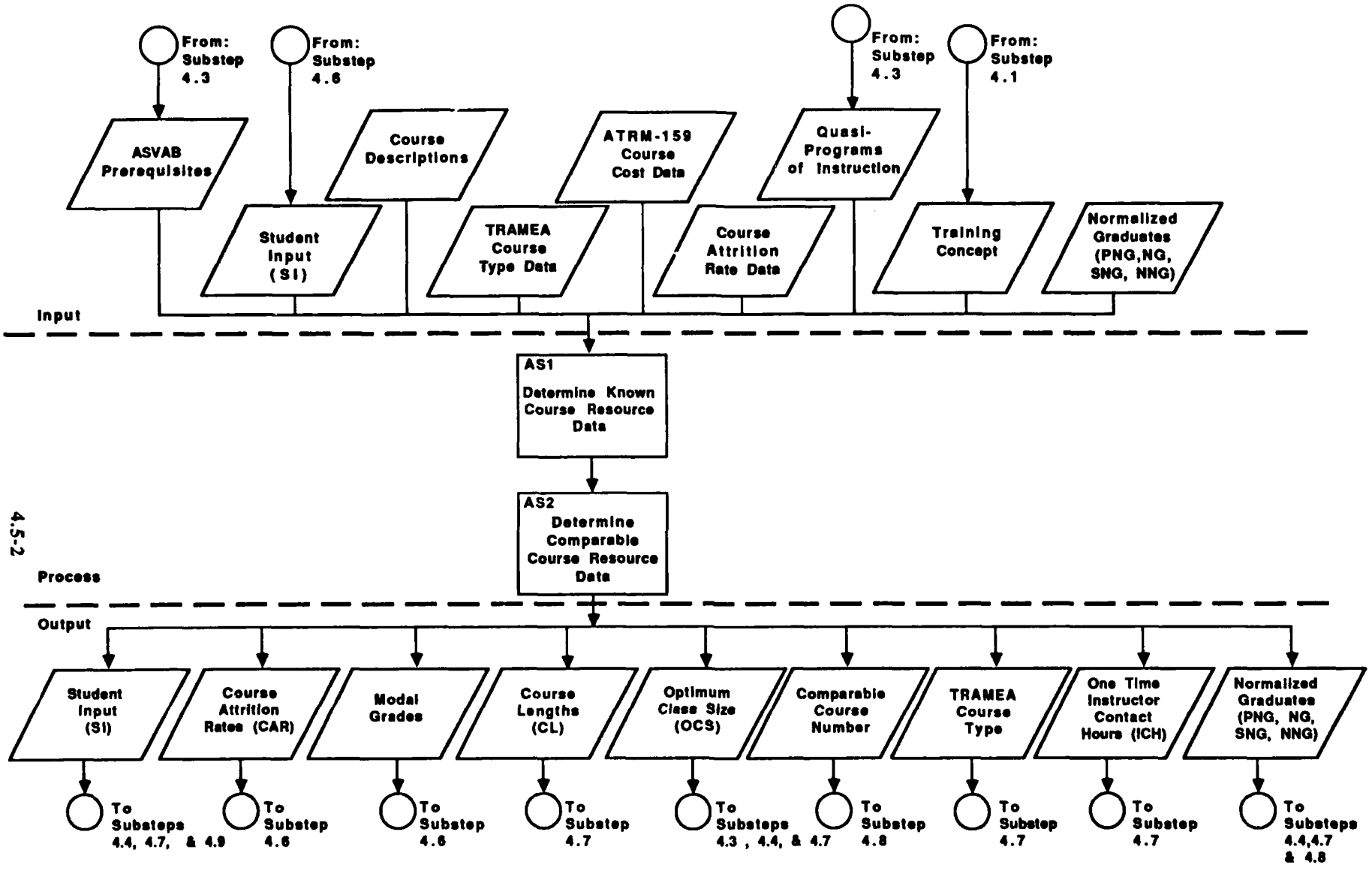

Figure 4.5-1. Overview of Substep 4.5, Determine Course Resource Data.

Action Step 1: Determine Known Course Resource Data

Discussion

In this action step the analyst determines course resource data that he or she will use in subsequent course resource and cost calculations. The analyst determines these course resource data for each course identified in Substep 4.1. The analyst identified some of these course resource data in previous action steps. He or she obtains the norm grads and student input from Substep 4.6 and course lengths and one-time ICH from Substep 4.3. The analyst converts the course length from hours to days and determines the one-time ICH total. Table 4.5-1 lists the course resource data elements.

Procedures

1. **Obtain Norm Grads and Student Input.**
   - Record on Worksheet 4.5-1 the configuration, MOS, and course number from Worksheet 4.1-3.
   - Obtain the following information from Substep 4.6:
     - System-Specific Norm Grads (i.e., PNG for the Predecessor System and SNG for the BCS and Proposed System)
     - Other System Norm Grads (ONG)
     - Norm Grads (i.e., NG for the Predecessor System and NNG for the BCS and Proposed System)
     - Student Input

NOTE

Student input and NNG for the BCS and the Proposed System will not be available if the course attrition rate (CAR) is to be determined using HCM procedures. The analyst will determine these data elements in Action Step 2 and Substep 4.6.

Table 4.5-1. Course Resource Data Elements

COURSE DATA ELEMENT	FROM	TO
System-Specific Norm Grads (PNG or SNG)	Substep 4.6	Substep 4.7 & 4.8
Other System Norm Grads (ONG)	Substep 4.6	Substep 4.7 & 4.8
Norm Grads (NG or NNG)	Substep 4.6	Substep 4.4, 4.7 & 4.8
Student Input (SI)	Substep 4.6	Substep 4.4 & 4.7
Course Length (NCL) - In Days	Substep 4.3	Substep 4.7
One-Time Instructor Contact Hours (ICH)	Substep 4.3	Substep 4.7
Modal Grade	Substep 4.1 (If known)	Substep 4.6
TRAMEA Course Type	Substep 4.1 (If known)	Substep 4.7
Course Attrition Rate (CAR)	Substep 4.1 (If known)	Substep 4.6
Optimum Class Size (OCS)	Substep 4.1 (If known)	Substep 4.3, 4.4 & 4.7

2. **Determine Course Length.**

   - For each new or modified course, obtain the course length from Substep 4.3.
   - Apply the following formula to convert course length from hours to days and add weekends:

     NCL = 1.4 x .125 x CL

     Where:

     NCL = New Course Length
     CL = Existing Course Length (in hours)
   - Round course lengths to the nearest tenth of a day (e.g., 8.34 to 8.3, 24.78 to 24.8).
   - For unmodified courses, obtain the NCL from Substep 4.1.

3. **Obtain One-Time ICH.**

   - Obtain from Substep 4.3, the Type of Instruction Summary for each new or modified course.
   - Apply the following equation:

$$ICH = \sum_{i=1}^{m} \sum_{j=1}^{n} ML_i \times NGP_j$$

     Where:

     ICH = Instructor Contact Hours (One-Time)
     ML = Method Length
     NGP = Number of Groups Per Method
   - Round the instructor contact hours to the nearest tenth.
   - For each course that was not modified, obtain the course's one-time ICH from Substep 4.1.

4. **Obtain Other Course Resource Data.**

   - Obtain from Substep 4.1 each configuration's course summary worksheets (Worksheet 4.1-3).
   - If the following course data elements appear on this worksheet, record them on Worksheet 4.5-1:
     - Modal Grade
     - TRAMEA Course Type
     - Course Attrition Rate
     - Optimum Class Size

- If these data elements are to be determined using HCM procedures, leave the worksheet blank and proceed to Action Step 2. Always use Action Step 2 to determine the comparable course number.

Procedure 1 Example

The XXX-13T10 course is required to train the Remotely Piloted Vehicle (RPV) operator. The analyst obtains the following information from Substep 4.1:

Configuration: BCS
MOS: 13T
Course Number: XXX-13T10

The analyst does not know the norm grads and student input because he or she has not completed Substep 4.6. Student input data are not available at this time because a course attrition rate (CAR) has not been determined. As shown in Figure 4.5-2, the analyst uses HCM procedures to determine the CAR. The analyst can enter these data after he or she has completed Action Step 2 and Substep 4.6.

Procedure 2 Example

The BCS XXX-13T10 course length (CL) is 894 hours. The analyst determines the new course length as follows:

NCL = 1.4 x .125 x 894
= 156.45
= 156.5

Procedure 3 Example

The analyst uses the Type of Instruction Summary generated in Substep 4.3 to determine the one-time ICH. The analyst calculates total ICH as follows:

Type of Instruction	Hours	x	Groups	=	ICH
C	196.2		1		196.2
PE3	90.0		1		90.0
PE1	288.0		3		864.0
D	11.0		1		11.0
E1	113.5		3		340.5
E3	7.0		1		7.0
TV	1.4		1		1.4
P1	7.4		1		7.4
E2	13.1		3		39.3
E2	1.5		4		6.0
PE2	123.1		3		369.3
PE1	16.8		2		33.6
Totals	869.0				1,965.7

WORKSHEET 4.1-3

Use this worksheet to document the course summary.

CONFIGURATION: BCS

MOS: 13T

COURSE DATA ELEMENT	COURSES OF INSTRUCTION					
	COURSE #1	COURSE #2	COURSE #3	COURSE #4	COURSE #5	COURSE #6
Course Number	XXX-13T10	XXX-ASIP9	XXX-13T30			
ASI/SQI	N/A	P9	N/A			
Skill Level	1	1	3			
Maintenance Level	N/A	ORG	N/A			
Proponent	USAFAS	USAFAS	USAFAS			
Training Location	Ft. Sill	Ft. Sill	Ft. Sill			
Course Security Clearance	TBD	TBD	TBD			
ASVAB Prerequisite	TBD	TBD	TBD			
Student Input (SI)	TO BE DETERMINED BY HCM					
Course Length (NCL) - In Days	TO BE DETERMINED BY HCM					
One Time Instructor Contact Hours (ICH)	TO BE DETERMINED BY HCM					
Modal Grade	HCM	HCM	HCM			
TRAMEA Course Type	HCM	HCM	HCM			
Course Attrition Rate (CAR)	HCM	HCM	HCM			
Optimum Class Size (OCS)	35	HCM	HCM			

☐ Required for subsequent training cost and resource calculationsIf unknown, determine using HCM procedures.

Figure 4.5-2. Example of a BCS course summary.

Procedure 4 Example

The analyst reviews Worksheet 4.1-1 for all remaining data elements. The worksheet indicates that the analyst must use HCM procedures to determine modal grade, TRAMEA course type, and course attrition rate. The optimum class size is 35. Figure 4.5-3 shows Action Step 1's results.

WORKSHEET 4.5-1

Use this worksheet to document course resource data.

CONFIGURATION: BCS
MOS: 13T

COURSE NUMBER: XXX-13T10
COMPARABLE COURSE NUMBER:

COURSE DATA ELEMENTS	CONFIGURATION				
	PREDECESSOR	BCS	PROPOSED 1	PROPOSED 2	PROPOSED 3
System-Specific Norm Grads (PNG or SNG)	NONE				
Other System Norm Grads (ONG)	NONE				
Norm Grads (NG or NNG)	NONE				
Student Input (SI)	NONE				
Course Length (NCL) - In Days	NONE	156.5			
One Time Instructor Contact Hours (ICH)	NONE	1965.7			
Modal Grade	NONE				
TRAMEA Course Type	NONE				
Course Attrition Rate (CAR)	NONE				
Optimum Class Size (OCS)	NONE	35			

Figure 4.5-3. Example of a BCS course's resource data.

Action Step 2: Determine Comparable Course Resource Data

Discussion

In this action step the analyst determines a comparable course to be used to calculate course costs. The analyst also develops course data elements for any new courses.

The Army's historical course-cost data base is the Training and Doctrine Command's (TRADOC) Cost Analysis Program, which provides costs for courses of instruction conducted in TRADOC formal schools and training centers. The reports this data base generates are known as ATRM-159 reports. TRADOC produces these reports every year.

The analyst must identify comparable courses in the following situations because ATRM-159 reports will not be available: the data base is out-of-date and therefore does not contain data for a course; the New System's training requirements create the need for a new course; or a non-Army course is required. In each case, the analyst must identify a comparable course for which an ATRM-159 report exists. The analyst then uses the ATRM-159 data from the comparable course to estimate costs and to determine course resource data elements.

Procedures

1. **Determine Comparable Courses for Each New or Modified Course.**
   - Obtain the courses listed on Worksheet 4.1-3.
   - Look up the course in the ATRM-159 data base.
   - If the course title and number match, even though the length may have changed, use that course's ATRM-159 report.
   - If an ATRM-159 report does not exist for the course, determine whether the course evolved from another course or whether the MOS has been renamed. In either situation, use the existing course's ATRM-159 report.
   - If the course is new, taught in a non-Army school, or requires data elements to be estimated by the HCM, compare the course's program of instruction and other course information with similar descriptions of existing courses. Identify "candidate comparable courses" (i.e., the courses that come closest to matching the new or modified course description). Complete Worksheet 4.5-2 for each candidate comparable course.

- Consider the following criteria to determine the best candidate:
  - taught at similar/same school with same proponent
  - in same Career Management Field (CMF)
  - same skill level
  - similar course length
  - similar student input per year
  - same maintenance level
  - similar one-time instructor contact hours
  - similar course content (i.e., trains similar equipment with similar task and skill requirements)
  - similar course attrition rate
  - similar Armed Services Vocational Aptitude Battery prerequisite (subtest and score)
- After investigating these criteria, discuss the candidate comparable course with SMEs in the Directorate of Training Developments (DOTD) at the course's proponent school.
- Select the "best" candidate as the comparable course and record it on Worksheet 4.5-1. Use the data elements on Worksheet 4.5-2 to complete Worksheet 4.5-1.

Procedure 1 Example

Situation: The current program of instruction for the 160-31S10 course specifies a length of 14 weeks and 2 days. The TRADOC course cost report (ATRM-159) for this same course specifies a length of 31 weeks.

Decision: Because only the course length has changed, the analyst uses the TRADOC report associated with 160-31S10 to estimate costs and resources.

Situation: Course 611-63D10 is currently being conducted at the Field Artillery School, but no reference to it can be found in the TRADOC course cost reports. Further investigation reveals that Career Management Field (CMF) 63, to which MOS 63D belongs, was reorganized a few years ago. At that time, MOS 63D split from MOS 63C. The Skill Level 1 course for MOS 63C was 611-63C10. The analyst locates this course number in the TRADOC course cost reports.

Decision: Because 611-63D10 had split from 611-63C10, the analyst would use the 611-63C10 cost and resource information available through the TRADOC course cost program to estimate cost and resources for 611-63D10.

Situation: The Army's new RPV will require a new operator MOS. New courses of instruction will be needed to train the soldiers who will perform the duties of this new MOS. An investigation of potential courses results in the information presented in Figure 4.5-4.

Decision: The analyst compares the three possible matches and prefers 221-13R10 Closer similarities in terms of course length, number of graduates, instructional strategy, and course content exist between XXX-13T10 and 221-13R10.

The analyst consults RPV SMEs in the Directorate of Training Developments at the Field Artillery School. The SMEs agree that among courses taught at the school, 221-13R10 best matches the proposed RPV operator course.

Using the 221-13R10 data elements, the analyst obtains the following results:

Modal Grade: E2
TRAMEA Course Type: 6
Course Attrition Rate: .01
Optimum Class Size: 18

(continued)

WORKSHEET 4.5-2

Use this worksheet to document comparable courses.

CONFIGURATION: BCS

COURSE DATA ELEMENTS	COURSE EVALUATED	COMPARABLE COURSES				
		COURSE #1	COURSE #2	COURSE #3	COURSE #4	COURSE #5
Course Number	XXX-13T10	221-13R10	043-15D10	042-13M10		
Career Management Field (CMF)	13	13	13	13		
MOS / ASI	13T	13R	15D	13M		
Skill Level	1	1	1	1		
Maintenance Level	NA	NA	NA	NA		
Proponent	USAFAS	USAFAS	USAFAS	USAFAS		
Training Location	Ft. Sill	Ft. Sill	Ft. Sill	Ft. Sill		
Course Security Clearance	TBD	U	C	C		
ASVAB Prerequisite	TBD	SC 100	OF 100	OF 100		
Student Input (SI)	232	244	651	79		
Course Length (NCL) - In Days	156.5	59	35	33		
One Time Instructor Contact Hours (ICH)	1965.7	1396.0	580.0	800.0		
Modal Grade	HCM	E2	E2	E2		
TRAMEA Course Type	HCM	6	6	6		
Course Attrition Rate (CAR)	HCM	.01	.22	.00		
Optimum Class Size (OCS)	35	18	12	10		
Cost Per Graduate	NOT APPLICABLE	$10,064	$6,186	$3,687		
Content Similarity (1-5)	NOT APPLICABLE	3	4	4		
Selected	NOT APPLICABLE	X				

Required for Subsequent Training Cost and Resource Calculations

Critical Decision Factors for Selecting Comparable Courses

Figure 4.5-4. Example of a BCS comparable course's resource data.

Procedure 1 Example (continued)

The analyst completes Substep 4.6, which yields the following results:

System-Specific Norm Grads: 230
Other System Norm Grads: 0
New Norm Grads: 230
Student Input: 232

Figure 4.5-5 illustrates these results.

WORKSHEET 4.5-1

Use this worksheet to document course resource data.

CONFIGURATION: BCS
MOS: 13T

COURSE NUMBER: XXX-13T10
COMPARABLE COURSE NUMBER: 221-13R10

COURSE DATA ELEMENTS	COMPARABLE COURSES				
	PREDECESSOR	BCS	PROPOSED 1	PROPOSED 2	PROPOSED 3
System-Specific Norm Grads (PNG or SNG)	NONE	230			
Other System Norm Grads (ONG)	NONE	0			
Norm Grads (NG or NNG)	NONE	230			
Student Input (SI)	NONE	232			
Course Length (NCL) - In Days	NONE	156.5			
One Time Instructor Contact Hours (ICH)	NONE	1965.7			
Modal Grade	NONE	E2			
TRAMEA Course Type	NONE	6			
Course Attrition Rate (CAR)	NONE	.01			
Optimum Class Size (OCS)	NONE	35			

Figure 4.5-5. Example of additional BCS course resource data.

SUBSTEP 4.5
WORKSHEETS

WORKSHEET 4.5-1

Use this worksheet to document course resource data.

CONFIGURATION: **COURSE NUMBER:**

MOS: **COMPARABLE COURSE NUMBER:**

COURSE DATA ELEMENTS	CONFIGURATION				
	PREDECESSOR	BCS	PROPOSED 1	PROPOSED 2	PROPOSED 3
System-Specific Norm Grads (PNG or SNG)					
Other System Norm Grads (ONG)					
Norm Grads (NG or NNG)					
Student Input (SI)					
Course Length (NCL) - In Days					
One Time Instructor Contact Hours (ICH)					
Modal Grade					
TRAMEA Course Type					
Course Attrition Rate (CAR)					
Optimum Class Size (OCS)					

WORKSHEET 4.5-2

Use this worksheet to document comparable courses.

CONFIGURATION:

COURSE DATA ELEMENTS	COURSE EVALUATED	COMPARABLE COURSES				
		COURSE #1	COURSE #2	COURSE #3	COURSE #4	COURSE #5
Course Number						
Career Management Field (CMF)						
MOS / ASI						
Skill Level						
Maintenance Level						
Proponent						
Training Location						
Course Security Clearance						
ASVAB Prerequisite						
Student Input (SI)						
Course Length (NCL) - In Days						
One Time Instructor Contact Hours (ICH)						
Modal Grade						
TRAMEA Course Type						
Course Attrition Rate (CAR)						
Optimum Class Size (OCS)						
Cost Per Graduate	NOT APPLICABLE					
Content Similarity (1-5)	NOT APPLICABLE					
Selected	NOT APPLICABLE					

Required for Subsequent Training Cost and Resource Calculations

Critical Decision Factors for Selecting Comparable Courses

Substep 4.6: Determine Student Input

Overview

In this substep the analyst determines student input, which is the number of students to be trained annually in a course of instruction. Student input is one of the major factors used in calculating training man-day, instructor, and course cost requirements. Figure 4.6-1 is an overview of this substep.

The analyst uses the personnel requirements from Step 3 in this substep. These requirements are the number of system-specific personnel needed to operate and maintain the various system alternatives.

The HCM personnel requirements do not include student attrition. The analyst must therefore apply a projected attrition rate to these personnel requirements. By adjusting the requirements to account for attrition, the analyst obtains a more accurate projection of cost and resource requirements.

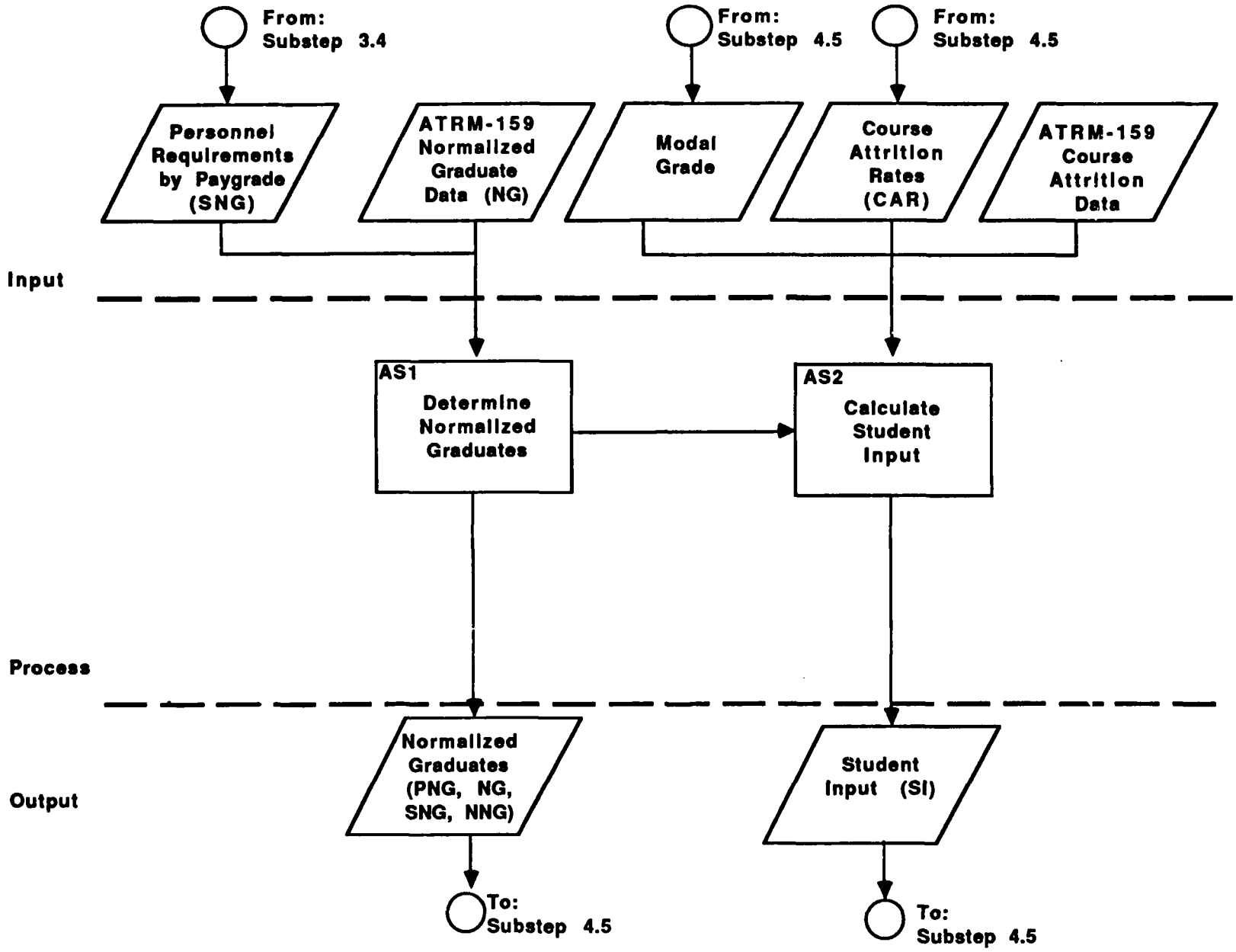

Figure 4.6-1. Overview of Substep 4.6, Determine Student Input.

Action Step 1: Determine Normalized Graduates

Discussion

In this action step the analyst determines the number of required course graduates. The number of graduates is expressed as normalized graduates. Normalized graduates (abbreviated as "norm grads") are the number of students who satisfactorily complete a course, adjusted for those students in training across fiscal years (i.e., carryovers).

The analyst uses the norm grads to calculate student input. The analyst will also use the norm grads in later substeps to calculate training man-days, instructors, and course costs.

The analyst must determine the Predecessor System norm grads to calculate "other norm grads" and "new course norm grads." The analyst can use one of four approaches to determine the Predecessor System norm grads. These approaches are described in Procedure 1 below.

Procedures

1. **Determine Predecessor System Norm Grads (PNG).**

   - Obtain the ATRM-159 report for each Predecessor System course. The norm grads (NG) are identified as equivalent grads on the top of the report.
   - Record the NG on Worksheet 4.6.1.
   - Use one of the following approaches to determine the Predecessor System norm grads:.

   Approach 1

   - If the MOS is system-specific, use the norm grads from the Predecessor System's course.

   Approach 2

   - If the MOS operates or maintains a small number of different weapon systems, contact course personnel to determine the Predecessor System's student requirements. Obtain an estimate of the percentage of graduates that receive assignments to units supporting the different weapon systems.

Approach 3

- If the course includes system-specific tracks of instruction, determine the percentage of students that receive training in the system-specific track. Translate these percentages to estimates of Predecessor System graduates.

Approach 4

- Ask the manpower analyst to determine the percentage of Predecessor System equipment (PPE) being replaced. The manpower analyst must consult the Tables of Organization and Equipment (TOE) and divide the number of Predecessor Systems being replaced by the total number of Predecessor Systems.
- Ask the manpower analyst to obtain the Predecessor System's manpower requirements by MOS and equipment (PM) from the TOE and the total Predecessor System manpower by MOS (TPM) from the TAPA Force Management Books.
- Use the following formula to determine the Predecessor System norm grads:

$$PNG = 1 - \frac{(PPE \times PM)}{TPM} \times NG$$

Where:

PNG	=	Predecessor System Norm Grads
PPE	=	Percentage of Predecessor System Equipment Being Replaced
PM	=	Predecessor System TOE Manpower
TPM	=	Predecessor System Total Force Manpower
NG	=	Number of Existing Course Norm Grads

- Record the PNG on Worksheet 4.6-1.

2. **Determine Other System Norm Grads (ONG).**

- Use the following formula to determine the other system norm grads:

$$ONG = NG - PNG$$

Where:

ONG = Number of Other System Norm Grads

NG = Number of Existing Course Norm Grads

PNG = Number of Predecessor System Grads

- Record the ONG on Worksheet 4.6-1.

3. **Determine New Course Norm Grads (NNG).**

   - Obtain the Intake-to-Paygrade personnel requirements from Substep 3.4 and the modal grades from Substep 4.5. The intake-to-paygrade requirements are system-specific personnel requirements.
   - Match the modal grade to the intake-to-paygrade results to determine the system-specific norm grads (SNG).
   - Apply the following formula to determine a norm grad total for each New System course:

     NNG = SNG + ONG

     Where:

     NNG = Number of New Course Norm Grads

     SNG = Number of System-Specific Norm Grads (from Intake-to-Paygrade results)

     ONG = Number of Other System Norm Grads (from Procedure 2)

   - Record the NNG on Worksheet 4.6-1.

Procedure 1 Example

The analyst must determine how many 101-31E10 course graduates repair the Predecessor System's radios. The MOS Course Cost Report for 101-31E10 states that there were 316 equivalent graduates.

Following the guidelines of Approach 2, the analyst contacts the 101-31E10 course chief. The chief estimates that 15 percent of the course graduates receive assignments to units that repair Predecessor System radios. The analyst multiplies this percentage by the number of norm grads to determine the number of Predecessor System norm grads:

$$\begin{aligned} PNG &= 316 \times 15\% \\ &= 47.4 \\ &= 47 \end{aligned}$$

Procedure 2 Example

The analyst determines the number of other system norm grads.

$$\begin{aligned} ONG &= 316 - 47 \\ &= 269 \end{aligned}$$

Procedure 3 Example

The 101-31E10 course is a BCS course that trains radio maintenance personnel. The modal grade matches paygrade E3. Intake-to-paygrade results from Step 3 indicate a requirement for 45 soldiers at this paygrade. The analyst determines the new course norm grads.

$$\begin{aligned} NNG &= 45 + 269 \\ &= 314 \end{aligned}$$

Action Step 2: Calculate Student Input

Discussion

In this action step the analyst adjusts the number of system-specific personnel to account for course attrition. The analyst obtains course attrition rates from TRADOC Form 812-R. The analyst should consult the Resource Management Division at the TRADOC school to determine the percentage of soldiers who repeat the course; only those soldiers who repeat the course should be included in the course attrition rate.

The soldiers who fail the course and are not allowed to repeat must migrate to another MOS or leave the Army. Migration and attrition are included in the personnel pipeline calculations in Step 3. Therefore, if the analyst were to count these soldiers in the course attrition rate, the soldiers would be double counted.

Procedures

1. **Calculate Student Input.**

   - Obtain the actual number of attritors for each Predecessor System course from TRADOC Form 812-R, Column 1 (Attrition: U.S.).
   - Apply the following formula to determine the student input for each Predecessor System course:

     $$SI = NG + AT$$

     Where:

     SI = Student Input

     NG = Number of Existing Course Norm Grads

     AT = Attritors
   - Record the student input on Worksheet 4.6-2.
   - Obtain from Substep 4.5 the Course Attrition Rates (CAR) for each BCS and Proposed System course.
   - Apply the following formula to determine the student input for each BCS and Proposed System course:

     $$SI = \frac{NNG}{1 - CAR}$$

Where:

SI = Student Input

NNG = Number of New Course Norm Grads

CAR = Course Attrition Rate

- Record the student input on Worksheet 4.6-3.

Procedure 1 Example

The BCS course attrition rate is 27 percent. The analyst determines the student input as follows:

$$SI = \frac{314}{1 - .27}$$

$$= 430.1$$

$$= 430$$

SUBSTEP 4.6
WORKSHEETS

WORKSHEET 4.6-1

Use this worksheet to determine normalized graduates.

MOS	Course Number	Normalized Graduates(NG)	Predecessor System Normalized Graduates (PNG)	Other System Normalized Graduates (ONG)	New Course Normalized Graduates (NNG)

WORKSHEET 4.6-2

Use this worksheet to determine the student input for each Predecessor System course.

MOS	Course Number	Existing Course Norm Grads (NG)	Attritors (AT)	Student Input (SI)

WORKSHEET 4.6-3

Use this worksheet to determine the student input for the BCS and Proposed System courses.

MOS	Course Number	New Course Norm Grads (NNG)	Course Attrition Rate (CAR)	Student Input (SI)

Substep 4.7: Determine Course Resource Requirements

Overview

In this substep the analyst determines the course resource requirements for the Predecessor System, Baseline Comparison System (BCS), and Proposed System. Figure 4.7-1 is an overview of this substep.

First, the analyst determines the number of training man-days, a major training resource requirement. The analyst uses these training times as input to the course cost requirements calculations.

The analyst determines instructor requirements in the two remaining action steps. In Action Step 2 the analyst calculates monthly instructor contact hours for each course of instruction. The instructor contact hour (ICH) is the basic workload measure used to determine instructor requirements.

In Action Step 3 the analyst uses TRADOC manpower staffing standards to calculate instructor requirements.

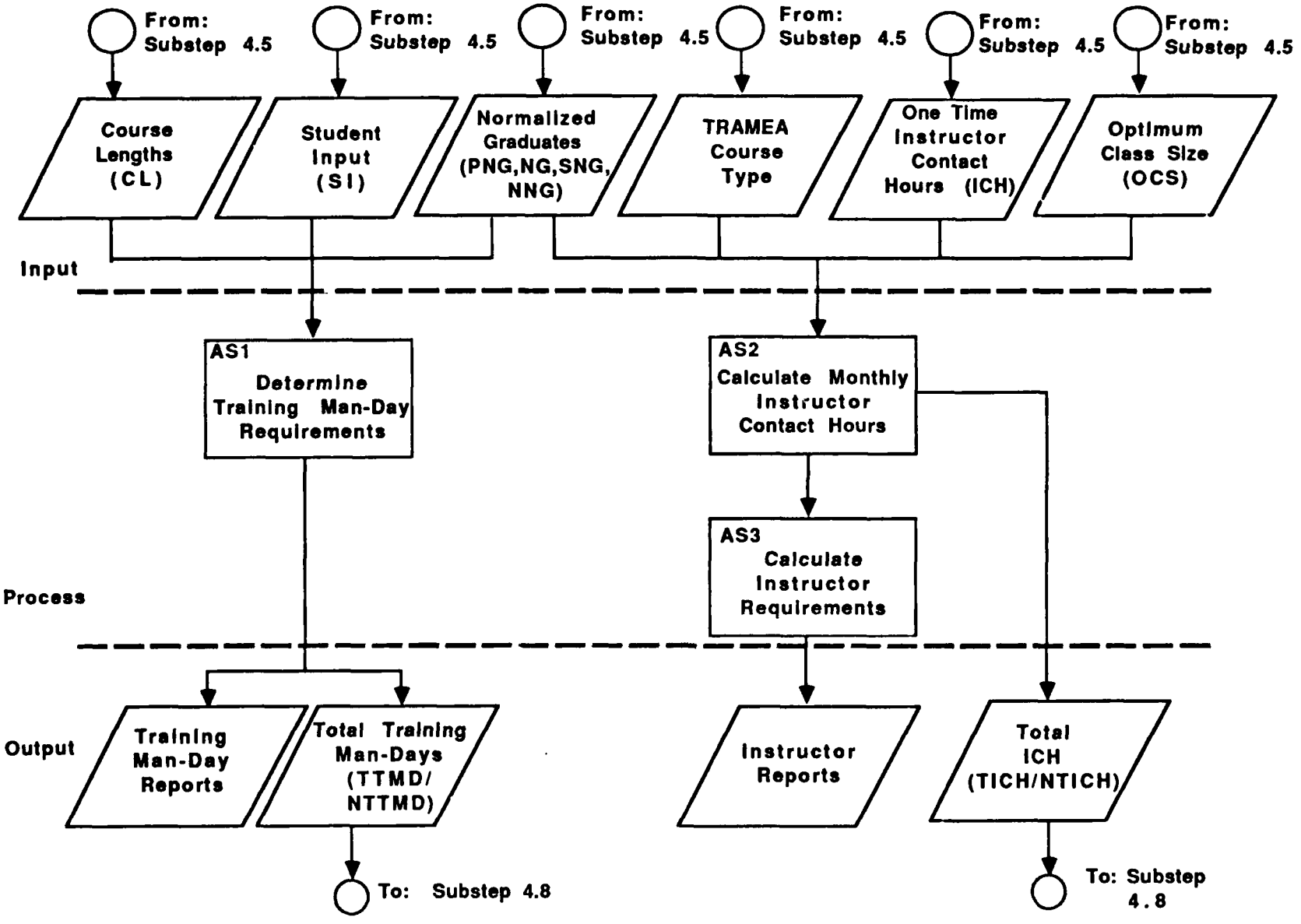

Figure 4.7-1. Overview of Substep 4.7, Determine Course Resource Requirements.

Action Step 1: Determine Training Man-Day Requirements

Discussion

In this action step the analyst calculates annual training man-day requirements. Annual training man-day requirements are one of the major ways to measure the design differences of various system alternatives. The number of man-days spent in training represents a substantial system-specific cost to the Army, for these days represent time lost from unit assignment. Training man-days comprise the largest component of the transients, trainees, holdees, and students (TTHS) rate. Additionally, the amount of time required for formal training is a major factor in determining the need for new Military Occupational Specialties (MOSs) and Additional Skill Identifiers (ASIs).

Procedures

1. **Calculate Total Training Man-Days (TTMD) for Each Course.**

   - Obtain student input, course length, and course attrition rate for each course and record these data on Worksheet 4.7-1.
   - Calculate total training man-days for each Predecessor System course:

     TTMD = CL x SI (1 - .5 (CAR))

     Where:

     TTMD = Total Training Man-Days
     CL = Course Length (in days)
     SI = Student Input
     CAR = Course Attrition Rate
   - Record the TTMD on Worksheet 4.7-1.
   - Calculate total training man-days for each BCS and Proposed System course:

     NTTMD = NCL x SI (1 - .5 (CAR))

Where:

NTTMD = New Total Training Man-Days
NCL = New Course Length (in days)
SI = Student Input
CAR = Course Attrition Rate

- Round the training man-days to the nearest whole man-day (e.g., 816.3 = 816 man-days).
- Record the NTTMD on Worksheet 4.7-2.

2. **Calculate System-Specific Training Man-Days.**

- From Substep 4.6, obtain system-specific norm grads, new course norm grads, Predecessor System norm grads, and existing course norm grads.
- Calculate the system-specific training man-days for each Predecessor System course:

$$ATMD = TTMD \times \frac{PNG}{NG}$$

Where:

ATMD = Annual Training Man-Days
TTMD = Total Training Man-Days
PNG = Number of Predecessor System Norm Grads
NG = Number of Existing Course Norm Grads

- Record the ATMD on Worksheet 4.7-3.
- Calculate the system-specific training man-days for each BCS and Proposed System course:

$$ATMD = NTTMD \times \frac{SNG}{NNG}$$

Where:

ATMD = Annual Training Man-Days
NTTMD = New Total Training Man-Days
SNG = Number of System-Specific Norm Grads
NNG = Number of New Course Norm Grads

- Record the ATMD on Worksheet 4.7-4.

Procedure 1 Example

The analyst obtains the following data for a Predecessor System course:

Student Input (SI)	=	432
Predecessor System Norm Grads (PNG)	=	47
Existing Course Norm Grads (NG)	=	316
Course Attrition Rate (CAR)	=	.27

TTMD = 148.1 x 432 (1 - .5(.27))
= 55,342

The analyst obtains the following data for a BCS course:

Student Input (SI)	=	430
System-Specific Norm Grads (SNG)	=	45
New Course Norm Grads (NNG)	=	314
Course Attrition Rate (CAR)	=	.27

NTTMD = 139.3 x 430 (1 - .5 (.27))
= 51,813

Procedure 2 Example

The analyst calculates the annual training man-days:

$$\text{Annual Training Man-Days (Predecessor)} = 55{,}342 \times \frac{47}{316}$$

$$= 8{,}231$$

$$\text{Annual Training Man-Days (BCS)} = 51{,}813 \times \frac{45}{314}$$

$$= 7{,}425$$

Action Step 2: Calculate Monthly Instructor Contact Hours

Discussion

In this action step the analyst calculates monthly instructor contact hours. The ICH is the primary measurement unit for determining the number of instructors and instructor supervisors. Instructor contact hours are man-hours the instructor spends with students. Monthly instructor contact hours are an input to the TRADOC equation for determining instructor manpower.

Procedures

1. **Determine Annual ICH Total.**

   - Obtain the optimum class size, the one-time instructor contact hours, and the student input for each course.
   - Apply the following equation:

$$\text{TICH or NTICH} = \frac{\text{SI}}{\text{OCS}} \times \text{ICH}$$

   Where:

   TICH = Existing Course Total Instructor Contact Hours
   NTICH = New Total Instructor Contact Hours
   SI = Student Input
   OCS = Optimum Class Size
   ICH = One-Time Instructor Contact Hours

2. **Determine Monthly ICH Total.**

   - Apply the following formula:

$$\text{MICH} = \frac{\text{NTICH or TICH}}{12}$$

   Where:

   MICH = Monthly Instructor Contact Hours
   NTICH = New Total Instructor Contact Hours

   - Round the monthly instructor contact hours to the nearest tenth.

Procedure 1 Example

The analyst determines the total ICH.

Optimum Class Size	=	20
Student Input	=	432
One-Time Instructor Contact Hours	=	2,277.1

$$TICH = \frac{432}{20} \times 2{,}277.1$$

$$= 49{,}185.4$$

Procedure 2 Example

The analyst then calculates the monthly ICH:

$$MICH = \frac{49{,}185.4}{12}$$

$$= 4{,}098.8$$

Action Step 3: Calculate Instructor Requirements

Discussion

In this action step the analyst calculates instructor requirements. The staffing standards developed and used by the TRADOC Management Engineering Activity (TRAMEA) provide a basis for calculating instructor requirements. The analyst applies different standards to Army formal schools and training centers. The standards include all instructors and instructor supervisors up to, but not including, the Division level. The standards do not include requirements for training developers/administrators, basic training instructors, personnel above training committee, or range instructors.

Procedures

1. Determine Instructor Manpower Requirements.

   - From Substep 4.5, obtain the TRAMEA course type for each course.
   - Match the course type to the following instructor manpower models:

     Officer Courses - Course Type Codes 01 through 04:

     $$IMR = \frac{66.62 + 1.540\ MICH}{142}$$

     Enlisted Courses - Course Type Codes 05 through 08:

     $$IMR = \frac{\frac{MICH}{(1.608 + .0001583\ MICH) + MICH}}{142}$$

     Enlisted Career Development Courses - Course Type Code 09:

     $$IMR = \frac{5.198 + 1.477\ MICH}{142}$$

Officer/Enlisted Courses - Course Type Codes 25 through 48:

$$IMR = \frac{31.84 + 1.402\ MICH}{142}$$

Self-paced Courses - All Courses:

$$IMR = \frac{70.62 + 1.403\ MICH}{142}$$

Defense Language Institute - All Courses:

$$IMR = \frac{211.7 + 1.615\ MICH}{142}$$

School of the Americas - All Courses:

$$IMR = \frac{55.46 + 1.704\ MICH}{142}$$

Academy of Health Sciences -

(1) Courses with 1,000 or fewer monthly contact hours

$$IMR = \frac{\frac{MICH}{(.2995 + .0006271\ MICH) + MICH}}{142}$$

(2) Course with over 1,000 monthly contact hours:

$$IMR = \frac{660.4 + 1.478\ MICH}{142}$$

Training Center Courses:

$$IMR = \frac{55.6 + 1.2641\ MICH}{145}$$

Where:

IMR = Instructor Manpower Requirements

MICH = Monthly Instructor Contact Hours

- Calculate instructor manpower requirements to the nearest thousandth.

2. **Determine System-Specific Instructor Manpower Requirements.**

   - From Substep 4.6, obtain system-specific norm grads, new course norm grads, Predecessor System norm grads, and existing course norm grads.
   - Apply the following equation to Predecessor System courses:

$$PIMR = IMR \times \frac{PNG}{NG}$$

Where:

PIMR = Predecessor System Instructor Manpower Requirements
IMR = Instructor Manpower Requirements
PNG = Number of Predecessor System Norm Grads
NG = Number of Existing Course Norm Grads

   - Apply the following equation to either the BCS or the Proposed System courses:

$$SIMR = IMR \times \frac{SNG}{NNG}$$

Where:

SIMR = System-Specific Instructor Manpower Requirements
IMR = Instructor Manpower Requirement
SNG = Number of System-Specific Norm Grads
NNG = Number of New Course Norm Grads

3. **Convert Fractional Manpower to Whole Instructors.**

   - Use Table 4.7-1 to convert fractional manpower requirements to a whole number of instructors.

Table 4.7-1. Fractional Conversion Table

Break Points	Number of Instructors
- 1.077	1
1.078 - 2.154	2
2.155 - 3.231	3
3.232 - 4.308	4
4.309 - 5.385	5
5.386 - 6.462	6
6.463 - 7.539	7
7.540 - 8.616	8
8.617 - 9.693	9
9.694 - 10.770	10
10.771 - 11.847	11
11.848 - 12.924	12
12.925 - 13.999	13

Drop the decimal when an instructor manpower requirement exceeds 13.999. For example, an instructor requirement of 15.892 equals 15 instructors.

Procedure 1 Example

The analyst obtains a TRAMEA course type of 6 from Substep 4.5 for the BCS 101-31E10 course. The analyst uses the second equation for enlisted courses and the BCS monthly instructor contact hours to calculate instructor manpower requirements.

$$IMR = \frac{3{,}756.4}{\frac{(1.608 + .0001583\ (3756.4))}{142}}$$

$$= 38.463$$

Procedure 2 Example

The analyst then determines the system-specific instructor manpower requirements by applying the BCS/Proposed System equation:

$$SIMR = 38.463 \times \frac{45}{314}$$

$$= 5.512$$

Procedure 3 Example

Using Table 4.7-1, the analyst converts the instructor manpower requirement of 5.512 to 6 instructors.

SUBSTEP 4.7
WORKSHEETS

WORKSHEET 4.7-1

Use this worksheet to determine training man-days for each Predecessor System course.

Course Number	Course Length (CL)	Student Input (SI)	Course Attrition Rate (CAR)	Total Training Man-Days (TTMD)

WORKSHEET 4.7-2

Use this worksheet to determine training man-days for each BCS and Proposed System course.

Course Number	New Course Length (NCL)	Student Input (SI)	Course Attrition Rate (CAR)	New Total Training Man-Days (NTTMD)

WORKSHEET 4.7-3

Use this worksheet to determine system-specific training man-days for each Predecessor System course.

Course Number	Total Training Man-Days (TTMD)	Predecessor System Norm Grads (PNG)	Existing Course Norm Grads (NG)	Annual Training Man-Days (ATMD)

WORKSHEET 4.7-4

Use this worksheet to determine system-specific training man-days for each BCS and Proposed System course.

Course Number	New Total Training Man-Days (NTTMD)	System-Specific Norm Grads (SNG)	New Course Norm Grads (NNG)	Annual Training Man-Days (ATMD)

Substep 4.8: Calculate Course Cost Requirements

Overview

In this substep the analyst calculates the dollar costs of the New System's institutional MOS training. The analyst calculates costs for each course required by the Predecessor System, the Baseline Comparison System (BCS), and the Proposed System. Figure 4.8-1 is an overview of this substep.

Training costs are one of the most important HARDMAN Comparability Methodology (HCM) results. Training dollars, like all dollars associated with a weapon system, are always critically managed resources. Training cost results are used for two purposes:

(1) As a cost discriminator among system alternatives. The comparisons of training affordability among competing Proposed System alternatives, between the Proposed System alternatives and the BCS, and the resource "footprint" comparisons between the Proposed System alternatives and the Predecessor System are fundamental to the HCM decision-making process.

(2) As a tradeoff tool for refining the New System's training concept. The HCM course cost model described in this substep is sensitive to a large number of course cost variables (e.g., student input, course length, course attrition rate, optimum class size, ammunition consumption, etc.). Accordingly, the HCM course cost model can be used to fine tune the training system for maximum cost efficiency.

The HCM course cost model and results can be used for other purposes:

(1) As a tool for making budget estimates. Because the model is based on the best available Army course cost data and is sensitive to changes in course parameters, the cost results can be used to update installation budget estimates based on changes in the New System's training concept.

(2) As a tool for use in other cost studies. Various cost studies are performed throughout a weapon system's life cycle and at all levels of Army decision making. Increasingly, questions of "cost versus benefit" are raised. The HCM course cost model can be used to support Cost and Operational Effectiveness Analysis (COEA), Cost and Training Effectiveness Analysis (CTEA), Training Development Studies (TDS), Life Cycle Cost Analysis (LCCA), "what if" cost studies, and other cost estimates.

The TRADOC Cost Analysis Program produces annual reports of training costs under Requirements Control Symbol ATRM-159(R2). Under this program, a separate report is produced for each course of instruction at each TRADOC school and training center. Figure 4.8-2 shows an example of this report (subsequently referred to as the ATRM-159 report), which will be used throughout this substep. The report contains course title and

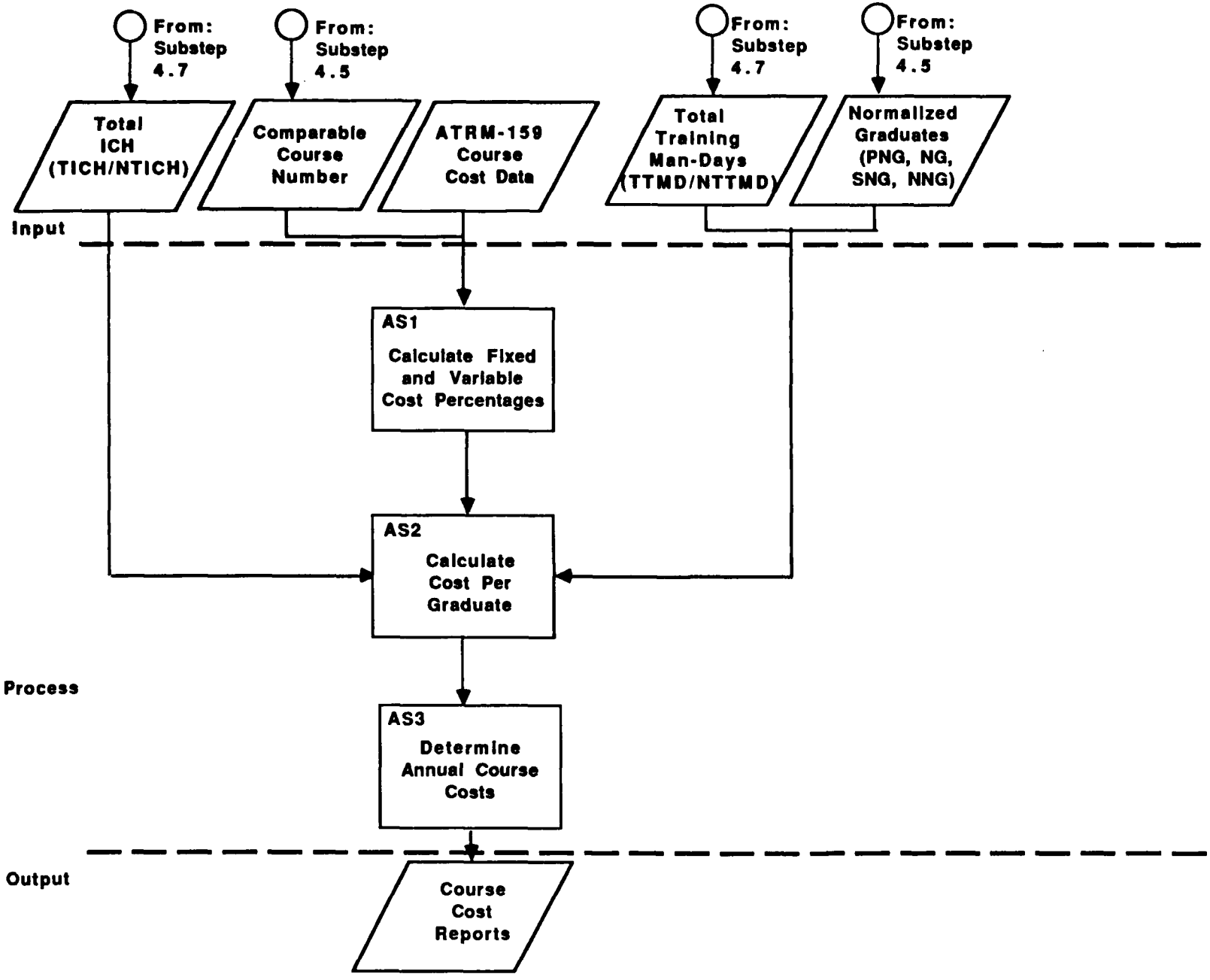

Figure 4.8-1. Overview of Substep 4.8, Calculate Course Cost Requirements.

RESIDENT TRAINING COST PER GRADUATE
FY85 TRAINING/FY87 DOLLARS

SIG221ST — 28 SEQUENCE #
24.4 COURSE/PHASE LENGTH (WKS)
FLYING HOURS
FLD RADIO RPR — E3 MODAL GRADE
101-31E10 — 513.95795 EQUIVALENT GRADS

	MIL PAY	CIV	O/M NP	OTHER	SUB TOTAL	NON FUNDED	TOTAL
DIRECT COSTS	q	r	s	t	u	v	w
1. Instruction	7,696	2,014	1,362		11,072	358	11,430
2. Flying Costs			0		0		0
3. Overhead	1,721	306	303	6	2,336	54	2,390
4. Ammunition				0	0		0
5. Equipment Depreciation				0	0		0
6. SUB-TOTAL	9,417	2,320	1,665	6	13,408	412	13,820
7. Student Costs							
A. Pay & Allowances	9,424	0		0	9,424	0	9,424
B. Per Diem			2,110		2,110		2,110
C. Travel			13	0	13		13
8. SUB-TOTAL	9,424	0	2,123	0	11,547	0	11,547
9. TOTAL DIRECT COSTS	18,841	2,320	3,788	6	24,955	412	25,367
INDIRECT COSTS							
10. Base Support	933	1,022	2,017	0	3,972	182	4,154
11. Medical Support	3,175	313	305	0	3,793	56	3,849
12. Family Housing	0	3	175	0	178	1	179
13. TOTAL INDIRECT COSTS	4,108	1,338	2,497	0	7,943	239	8,182
14. TOTAL DIRECT & INDIRECT	22,949	3,658	6,285	6	32,898	651	33,549
FIXED & VARIABLE COSTS							
15. Direct							
A. Fixed	2,494	613	440	2	3,549	109	3,658
B. Variable	16,347	1,707	3,348	4	21,406	303	21,709
16. Direct & Indirect							
A. Fixed	5,303	1,489	2,134	2	8,928	266	9,194
B. Variable	17,646	2,169	4,151	4	23,970	385	24,355

TOTAL/EGRAD $33,549

Figure 4.8-2. Sample ATRM-159 Report.

number; course/phase length, in weeks; the course modal grade; number of equivalent graduates; and costs, arrayed by cost category (e.g., Instructional Overhead, Ammunition, etc.) and by elements of expense (e.g., Military Pay, Civilian Pay, Non-personnel, etc.). For a full description of the ATRM-159 report and its input, refer to TRADOC Reg 11-5, *Cost Analysis Program (MOS/FMS Training Costs).*

In the action steps that follow, input taken from the ATRM-159 cost array will be identified using an abbreviation. Table 4.8-1 lists each of these abbreviations. New System cost variables are similar, but always begin with the letter "N." For example, the direct cost value for instruction in the cost category of Military Pay is abbreviated as "INMP." The new course abbreviation for this value would be "NINMP."

Table 4.8-1. ATRM-159 Report Variable Abbreviations

RESIDENT TRAINING COST PER GRADUATE FY85 TRAINING/FY87 DOLLARS

ABBREVIATED COURSE TITLE
COURSE NUMBER

CL COURSE/PHASE LENGTH (WKS)
FLYING HOURS
MODAL GRADE
NG EQUIVALENT GRADS

	MIL PAY	CIV	O/M NP	OTHER	SUB-TOTAL	NON-FUNDED	TOTAL
DIRECT COSTS	q	r	s	t	u	v	w
1. Instruction	INMP	INCIV	INNP	INOTH	INSUB	INNF	TIN
2. Flying Costs			FLYNP		FLYSUB		TFLY
3. Overhead	OHMP	OHCIV	OHNP	OHOTH	OHSUB	OHNF	TOH
4. Ammunition				AMMOP	AMMOSUB		TAMMO
5. Equip. Depreciation				EQPA	EQSUB		TEQ
6. SUBTOTAL	STDMP	STDCIV	STDNP	STDOTH	STDSUB	STDNF	TSTD
7. Student Costs							
A. Pay & Allowances	PAYMP	PAYCIV			PAYSUB	PAYNF	TPAY
B. Per Diem			PDOMA		PDSUB		TPD
C. Travel			TRVLOMA		TRVLSUB		TTRVL
8. SUBTOTAL	STSCMP	STSCCIV	STSCNP	STSCOTH	STSCSUB	STSCNF	TSTSC
9. Total Direct Costs	TDMP	TDCIV	TDNP	TDOTH	TDSUB	TDNF	TD
Indirect Costs							
10. Base Support	BSMP	BSCIV	BSNP	BSOTH	BSSUB	BSNF	TBS
11. Medical Support	MSMP	MSCIV	MSNP	MSOTH	MSSUB	MSNF	TMS
12. Family Housing	FHMP	FHCIV	FHNP	FHOTH	FHSUB	FHNF	TFH
13. Total Indirect Costs	TIMP	TICIV	TINP	TIOTH	TISUB	TINF	TI
14. Total Direct & Indirect	TDIMP	TDICIV	TDINP	TDIOTH	TDISUB	TDINF	TTCPG
15. Direct							
A. Fixed	DFMP	DFCIV	DFNP	DFOTH	DFSUB	DFNF	TDF
B. Variable	DVMP	DVCIV	DVNP	DVOTH	DVSUB	DVNF	TDV
16. Direct & Indirect							
A. Fixed	DIFMP	DIFCIV	DIFNP	DIFOTH	DIFSUB	DIFNF	TDIF
B. Variable	DIVMP	DIVCIV	DIVNP	DIVOTH	DIVSUB	DIFNF	TDIV

Action Step 1: Calculate Fixed and Variable Cost Percentages

Discussion

Of the direct and indirect costs in the ATRM-159 report, the analyst determines which costs are fixed and which costs will vary.

The analyst must calculate 16 variables, 8 each for direct and indirect costs. These variables are assigned the following abbreviations:

Abbreviation	Variables
PDMPF	Percent Direct Military Personnel Fixed
PDCIVF	Percent Direct Civilian Fixed
PDNPF	Percent Direct Non-Personnel Fixed
PDOTHF	Percent Direct Other Fixed
PDMPV	Percent Direct Military Personnel Variable
PDCIVV	Percent Direct Civilian Variable
PDNPV	Percent Direct Non-Personnel Variable
PDOTHV	Percent Direct Other Variable
PIMPF	Percent Indirect Military Personnel Fixed
PICIVF	Percent Indirect Civilian Fixed
PINPF	Percent Indirect Non-Personnel Fixed
PIOTHF	Percent Indirect Other Fixed
PIMPV	Percent Indirect Military Personnel Variable
PICIVV	Percent Indirect Civilian Variable
PINPV	Percent Indirect Non-Personnel Variable
PIOTHV	Percent Indirect Other Variable

Procedures

1. **Calculate Fixed and Variable Cost Percentages.**
   - From Substep 4.5, obtain the comparable course number for each course being studied.
   - Obtain the ATRM-159 report for each comparable course number.
   - Use the following equations to calculate fixed and variable cost percentages for the direct and indirect cost elements:

DIRECT COSTS

Fixed

$$PDMPF = \frac{DFMP}{(DFMP + DVMP)}$$

$$PDCIVF = \frac{DFCIV}{(DFCIV + DVCIV)}$$

$$PDNPF = \frac{DFNP}{(DFNP + DVNP)}$$

$$PDOTHF = \frac{PDFOTH}{(DFOTH + DVOTH)}$$

Variable

$$PDMPV = 1 - PDMPF$$

$$PDCIVV = 1 - PDCIVF$$

$$PDNPV = 1 - PDNPF$$

$$PDOTHV = 1 - PDOTHF$$

INDIRECT COSTS

Fixed

$$PIMPF = \frac{(DIFMP - DFMP)}{TIMP}$$

$$PICIVF = \frac{(DIFCIV - DFCIV)}{TICIV}$$

$$PINPF = \frac{(DIFNP - DFNP)}{TINP}$$

$$PIOTHF = \frac{(DIFOTH - DFOTH)}{TIOTH}$$

Variable

$$PIMPV = \frac{(DIVMP - DVMP)}{TIMP}$$

$$PICIVV = \frac{(DIVCIV - DVCIV)}{TICIV}$$

$$PINPV = \frac{(DIVNP - DVNP)}{TINP}$$

$$PIOTHV = \frac{(DIVOTH - DVOTH)}{TIOTH}$$

Procedure 1 Example

Using values from Figure 4.8-2, the analyst obtains the following results:

DIRECT COSTS

Fixed Costs

PDMPF = 2494 / (2494 + 16347)	= .13
PDCIVF = 613 / (613 + 1707)	= .26
PDNPF = 440 / (440 + 3348)	= .12
PDOTHF = 2 / (2 + 4)	= .33

Variable Costs

PDMPV = 1 - .13	= .87
PDCIVV = 1 - .26	= .74
PDNPV = 1 - .12	= .88
PDOTHV = 1 - .33	= .67

INDIRECT COSTS

Fixed Costs

PIMPF = (5303 - 2494) / 4108	= .68
PICIVF = (1489 - 613) / 1338	= .65
PINPF = (2134 - 440) / 2497	= .68
PIOTHF	= .00

Variable Costs

PIMPV = (17646 - 16347) / 4108	= .32
PICIVV = (2169 - 1707) / 1338	= .35
PINPV = (4151 - 3348) / 2497	= .32

Action Step 2: Calculate Cost Per Graduate

Discussion

In this action step the analyst calculates the cost per graduate for each course of instruction by developing a new value for each matrix variable in Table 4.8-1.

The analyst will combine the cost per graduate obtained from this action step with the number of students to be trained annually. The analyst can identify high course-cost drivers through a careful analysis of the matrix values obtained in this action step. This detailed inspection of course high drivers can provide a means of optimizing a course's instructional strategy as well as the New System's training concept.

Procedures

1. **Calculate Cost Per Graduate.**
   - For each course of instruction, obtain the data listed on Table 4.8-2.
   - Convert the ATRM-159 course length (CL) from weeks to days as follows. Where ATRM-159 course length is in the form X.Y weeks, then:

     CL (days) = (7 x X) + (Y/2)
   - Determine each ATRM-159 report's non-funded factor as follows:

     $$\text{Non-funded factor} = \frac{\text{INNF}}{\text{INCIV}}$$
   - Using these values and those derived in the two previous action steps, calculate a new cost per graduate using the formulas in Table 4.8-3.

Table 4.8-2. Required Data Elements

Substep	Data	Abbreviation
4.6	Number of existing course norm grads	NG
4.6	Number of new course norm grads	NNG
4.7	Total training man-days	TTMD
4.7	New total training man-days	NTTMD
4.7	Total instructor contact hours	TICH
4.7	New total instructor contact hours	NTICH

Table 4.8-3. Cost per Graduate Calculations

DIRECT COSTS

1. Instruction

$$NINMP = INMP \times \frac{NG}{NNG} \times PDMPF + \frac{PDMPV \times NTICH}{TICH}$$

$$NINCIV = INCIV \times \frac{NG}{NNG} \times PDCIVF + \frac{PDCIVV \times NTICH}{TICH}$$

$$NINNP = INNP \times \frac{NG}{NNG} \times PDNPF + \frac{PDNPV \times NTICH}{TICH}$$

$$NINOTH = INOTH \times \frac{NG}{NNG} \times PDOTHF + \frac{PDOTHV \times NTICH}{TICH}$$

NINNF = NINCIV x Non-Funded Factor

2. Flying Costs

FLYNP

3. Overhead

$$NOHMP = OHMP \times \frac{NG}{NNG} \times PDMPF + \frac{PDMPV \times NTICH}{TICH}$$

$$NOHCIV = OHCIV \times \frac{NG}{NNG} \times PDCIVF + \frac{PDCIVV \times NTICH}{TICH}$$

$$NOHNP = OHNP \times \frac{NG}{NNG} \times PDNPF + \frac{PDNPV \times NTICH}{TICH}$$

Table 4.8-3. Cost per Graduate Calculations (continued)

If Substep 4.4 is conducted, perform the following calculation:

$$NOHNP = AOHNP \times PDNPF + \frac{PDNPV \times NTICH}{TICH}$$

$$NOHOTH = OHOTH \times \frac{NG}{NNG} \times PDOTHF + \frac{PDOTHV \times NTICH}{TICH}$$

$$NOHNF = NOHCIV \times \text{Non-Funded Factor}$$

4. Ammunition

   AMMOPA or NAMMOPA (if Substep 4.4 is conducted)

5. Equipment Depreciation

   EQPA or NEQPA (if Substep 4.4 is conducted)

6. Subtotal

7. Student Costs

   A. Pay & Allowances

   $$NPAYMP = \frac{PAYMP \times NTTMD}{CL \times NNG}$$

   $$NPAYCIV = \frac{PAYCIV \times NTTMD}{CL \times NNG}$$

   $$NPAYNF = NPAYCIV \times \text{Non-Funded Factor}$$

   B. Per Diem

   $$NPDOMA = \frac{PDOMA \times NTTMD}{CL \times NNG}$$

Table 4.8-3. Cost per Graduate Calculations (continued)

C. Travel

NTRVLOMA = TRVLOMA

8. Subtotal

9. Total Direct Costs

NTDMP = NINMP + NOHMP + NPAYMP
NTDCIV = NINCIV + NOHCIV + NPAYCIV
NTDNP = NINNP + NFLYNP + NOHNP + NPDOMA + NTRVLOMA
NTDOTH = NINOTH + NOHOTH + NAMMOPA + NEQPA
NTDNF = NINNF + NOHNF + NPAYNF

INDIRECT COSTS

10. Base Support

$$NBSMP = BSMP \times \frac{NG}{NNG} \times PIMPF + \frac{PIMPV \times NTTMD}{TTMD}$$

$$NBSCIV = BSCIV \times \frac{NG}{NNG} \times PICIVF + \frac{PICIVV \times NTTMD}{TTMD}$$

$$NBSNP = BSNP \times \frac{NG}{NNG} \times PINPF + \frac{PINPV \times NTTMD}{TTMD}$$

$$NBSOTH = BSOTH \times \frac{NG}{NNG} \times PIOTHF + \frac{PIOTHV \times NTTMD}{TTMD}$$

NBSNF = NBSCIV x Non-Funded Factor

11. Medical Support

$$NMSMP = MSMP \times \frac{NG}{NNG} \times PIMPF + \frac{PIMPV \times NTTMD}{TTMD}$$

Table 4.8-3. Cost per Graduate Calculations (continued)

$$NMSCIV = MSCIV \times \frac{NG}{NNG} \times PICIVF + \frac{PICIVV \times NTTMD}{TTMD}$$

$$NMSNP = MSNP \times \frac{NG}{NNG} \times PINPF + \frac{PINPV \times NTTMD}{TTMD}$$

$$NMSOTH = MSOTH \times \frac{NG}{NNG} \times PIOTHF + \frac{PIOTHV \times NTTMD}{TTMD}$$

NMSNF = NMSCIV x Non-Funded Factor

12. Family Housing

$$NFHMP = FHMP \times \frac{NG}{NNG} \times PIMPF + \frac{PIMPV \times NTTMD}{TTMD}$$

$$NFHCIV = FHCIV \times \frac{NG}{NNG} \times PICIVF + \frac{PICIVV \times NTTMD}{TTMD}$$

$$NFHNP = FHNP \times \frac{NG}{NNG} \times PINPF + \frac{PINPV \times NTTMD}{TTMD}$$

$$NFHOTH = FHOTH \times \frac{NG}{NNG} \times PIOTHF + \frac{PIOTHV \times NTTMD}{TTMD}$$

NFHNF = NFHCIV x Non-Funded Factor

13. Total Indirect Costs

NTIMP = NBSMP + NMSMP + NFHMP
NTICIV = NBSCIV + NMSCIV + NFHCIV
NTINP = NBSNP + NMSNP + NFHNP
NTIOTH = NBSOTH + NMSOTH + NFHOTH
NTINF = NBSNF + NMSNF + NFHNF

Table 4.8-3. Cost per Graduate Calculations (continued)

14. Total Direct and Indirect Costs

```
NTDIMP = NTDMP + NTIMP
NTDICIV = NTDCIV + NTICIV
NTDINP = NTDNP + NTINP
NTDIOTH = NTDOTH + NTIOTH
NTDINF = NTDNF + NTINF
```

TOTAL TRAINING COST PER GRADUATE

```
NTTCPG = NTDIMP + NTDICIV + NTDINP + NTDIOTH + NTDINF
```

Procedure 1 Example

The analyst calculates costs for a BCS course supporting MOS 31E, Field Radio Repairer. Figure 4.8-2 shows the ATRM-159 report for the 31E course.

This example uses previously calculated values for variables:

Existing Course

TTMD = 55,342 (from Substep 4.7)
TICH = 49,185 (from Substep 4.7)
NG = 513 (from Substep 4.6)
CL = 170 (24.4 weeks converted to (7 x 24) + (4/2) days)

Non-funded Factor = .178 = $\frac{358}{2014}$

BCS Course

NTTMD = 51,813 (from Substep 4.7)
NTICH = 45,077 (from Substep 4.7)
NNG = 500 (from Substep 4.6)

PDMPF = .13
PDCIVF = .26
PDNPF = .13
PDOTHF = .33

PDMPV = .87
PDCIVV = .74
PDNPV = .87
PDOTHV = .67
PIMPF = .68
PICIVF = .65
PINPF = .68
PIOTHF = .00

PIMPV = .32
PICIVV = .35
PINPV = .32
PIOTHV = .00

(continued)

Procedure 1 Example (continued)

DIRECT COSTS

1. Instruction

$$NINMP = 7696 \times \frac{513}{500} \times .13 + \frac{.87 \times 450/7}{49185}$$

$$= 7896.096 \times .9273$$

$$= 7322.0498$$

$$NINCIV = 2014 \times \frac{513}{500} \times .26 + \frac{.74 \times 45077}{49185}$$

$$= 2066.364 \times .9382$$

$$= 1938.6627$$

$$NINNP = 1362 \times \frac{513}{500} \times .13 + \frac{.87 \times 45077}{49185}$$

$$= 1397.412 \times .9273$$

$$= 1295.8201$$

$$NINOTH = 0 \times \frac{513}{500} \times .33 + \frac{.67 \times 45077}{49185}$$

$$= 0$$

$$NINNF = 1938.6627 \times .178$$

$$= 345.082$$

2. Flying Costs

FLYNP

(continued)

Procedure 1 Example (continued)

3. Overhead

$$NOHMP = 1721 \times \frac{513}{500} \times .13 + \frac{.87 \times 45077}{49185}$$

$$= 1765.746 \times .9273$$

$$= 1637.3762$$

$$NOHCIV = 306 \times \frac{513}{500} \times .26 + \frac{.74 \times 45077}{49185}$$

$$= 313.956 \times .9382$$

$$= 294.5535$$

$$NOHNP = 303 \times \frac{513}{500} \times .13 + \frac{.87 \times 45077}{49185}$$

$$= 310.878 \times .9273$$

$$= 288.2772$$

$$NOHOTH = 6 \times \frac{513}{500} \times .33 + \frac{.67 \times 45077}{49185}$$

$$= 6.156 \times .944$$

$$= 5.8113$$

$$NOHNF = 294.5535 \times .178$$

$$= 52.4305$$

4. Ammunition

NAMMOPA or AMMOPA

(continued)

Procedure 1 Example (continued)

5. Equipment Depreciation

   NEQPA or EQPA

6. Subtotal

7. Student Costs

   A. Pay & Allowances

   $$NPAYMP = \frac{9424 \times 51813}{170 \times 500}$$

   $$= 5744.5378$$

   $$NPAYCIV = \frac{0 \times 51813}{170 \times 500}$$

   $$= 0$$

   $$NPAYNF = 0 \times .178$$

   $$= 0$$

   B. Per Diem

   $$NPDOMA = \frac{2110 \times 51813}{170 \times 500}$$

   $$= 1286.1815$$

   C. Travel

   NTRVLOMA = 13

(continued)

Procedure 1 Example (continued)

8. Subtotal

9. Total Direct Costs

NTDMP = 7322 + 1637 + 5745

= 14704

NTDCIV = 1939 + 295

= 2234

NTDNP = 1296 + 288 + 1286 + 13

= 2883

NTDOTH = 6

NTDNF = 345 + 52

= 397

INDIRECT COSTS

10. Base Support

$$NBSMP = 933 \times \frac{513}{500} \times .68 + \frac{.32 \times 51813}{55342}$$

= 957.258 x .9796

= 937.7299

(continued)

Procedure 1 Example (continued)

$$NBSCIV = 1022 \times \frac{513}{500} \times .65 + \frac{.35 \times 51813}{55342}$$

$$= 1048.572 \times .9777$$

$$= 1025.1888$$

$$NBSNP = 2017 \times \frac{513}{500} \times .68 + \frac{.32 \times 51813}{55342}$$

$$= 2069.442 \times .9796$$

$$= 2027.2253$$

$$NBSOTH = 0 \times \frac{513}{500} \times 0 + \frac{0 \times 51813}{55342}$$

$$= 0$$

$$NBSNF = 1025.1888 \times .178$$

$$= 182.4836$$

11. Medical Support

$$NMSMP = 3175 \times \frac{513}{500} \times .68 + \frac{.32 \times 51813}{55342}$$

$$= 3257.55 \times .9796$$

$$= 3191.096$$

$$NMSCIV = 313 \times \frac{513}{500} \times .65 + \frac{.35 \times 51813}{55342}$$

$$= 321.138 \times .9777$$

$$= 313.9766$$

(continued)

Procedure 1 Example (continued)

$$NMSNP = 305 \times \frac{513}{500} \times .68 + \frac{.32 \times 51813}{55342}$$

$$= 312.93 \times .9796$$

$$= 306.5462$$

$$NMSOTH = 0 \times \frac{513}{500} \times 0 + \frac{0 \times 51813}{55342}$$

$$= 0$$

NMSNF = NMSCIV x Non-Funded Factor

= 313.9766 x .178

= 55.8878

12. Family Housing

$$NFHMP = 0 \times \frac{513}{500} \times .68 + \frac{.32 \times 51813}{55342}$$

$$= 0$$

$$NFHCIV = 3 \times \frac{513}{500} \times .65 + \frac{.35 \times 51813}{55342}$$

$$= 3.078 \times .9777$$

$$= 3.0094$$

$$NFHNP = 175 \times \frac{513}{500} \times .68 + \frac{.32 \times 51813}{55342}$$

$$= 179.55 \times .9796$$

$$= 175.8872$$

(continued)

Procedure 1 Example (continued)

$$NFHOTH = 0 \times \frac{513}{500} \times 0 + \frac{0 \times 51813}{55342}$$

$$= 0$$

$$NFHNF = 3 \times .178$$

$$= .534$$

13. Total Indirect Costs

$$NTIMP = 938 + 3191$$

$$= 4129$$

$$NTICIV = 1025 + 314 + 3$$

$$= 1342$$

$$NTINP = 2027 + 307 + 176$$

$$= 2510$$

$$NTIOTH = 0$$

$$NTINF = 182 + 56 + 1$$

$$= 239$$

14. Total Direct and Indirect Costs

$$NTDIMP = 14704 + 4129$$

$$= 18833$$

(continued)

APPENDIX C: HCM-MIST CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS

A direct translation of HARDMAN Comparability Methodology (HCM) substeps and action steps to the Man Integrated Systems Technology (MIST) procedures and worksheets is not possible. MIST is not an "automated HARDMAN"; however, it is an automated methodology that uses the same input, performs similar calculations, and generates many of the same products.

The HCM consists of many step-by-step procedures that must be completed sequentially to generate products. MIST, through automation, combines many of these step-by-step procedures. This combination of procedures is possible because MIST performs all procedures involving mathematical computations. In addition, MIST automatically hands off and receives input/output generated by other procedures within the methodology.

MIST is not as complete as the HCM. For example, MIST does not directly determine operator requirements as does the HCM. MIST also does not compute the Standards of Grade Authorizations and is limited in its ability to handle complex force structures.

The following pages contain a crosswalk between the HCM and MIST. As explained above, the links are not direct. They indicate areas where similar parameters are being considered.

HCM - MIST CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS

Substep	Action Step	Data Elements	MIST Worksheets/Models
4.1	1	• Operator and Maintainer Training Source Indexes	• Operator Training Data Source Index (SRA230) • Maintainer Training Data Source Index (SRA240)
	2	• New System Training Concept	• None
4.2	1	• Predecessor System Tasks	• Predecessor Task Input (SRA220)
	2	• BCS Tasks	• Comparable Task Input (SRA221) • BCS Task Generation (SRA250)
	3	• Proposed System Tasks	• Comparable Task Input (SRA221) • New Configuration Task Generation (SRA260)
	4	• Tasks Assigned to Training	• Task Selection Factors (SRA289) • New Configuration Task Evaluation (SRA290)
4.3	1	• Predecessor System Programs of Instruction	• Course Input (SRA295) • Course Modification (SRA300)
	2	• BCS Programs of Instruction	• Course Input (SRA295) • Course Modification (SRA300)
	3	• Proposed System Quasi-Programs of Instruction	• Course Input (SRA295) • Course Modification (SRA300)
	4	• ASVAB Prerequisites	• Course Modification, Part II (SRA301)

HCM-MIST CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS (continued)

Substep	Action Step	Data Elements	MIST Worksheets/Models
4.4	1	• Training Devices/Equipment	• Predecessor Task Input (SRA220) • Comparable Task Input (SRA221) • BCS Task Generation (SRA250) • New Configuration Task Generation (SRA260)
	2	• Petroleum, Oil, and Lubricant Requirements	• None
	3	• Ammunition Requirements	• None
	4	• Facility Requirements	• None
4.5	1 & 2	• Course Resource Data (Student Input, Course Attrition Rate, Modal Grades, Course Length, Optimum Class Size, Course Type, and One Time Instructor Contact Hours)	• Training Resource (SRA310, 311, 312)
4.6	1	• Normalized Graduates	• Training Cost and Resources
	2	• Student Input	• Training Resource (SRA310)
4.7	1	• Training Man-Days	• Training Cost and Resources
	2 & 3	• Number of Instructors	• Training Cost and Resources

HCM-MIST CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS (continued)

Substep	Action Step	Data Elements	MIST Worksheets/Models
4.8	1	• Fixed and Variable Cost Percentages	• Training Cost and Resources
	2	• Cost per Graduate	• Training Cost and Resources
	3	• Annual Course Costs	• Training Cost and Resources
4.9	1 & 2	• Unit Training Products	• None

APPENDIX D: HCM MPT DOCUMENTS CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS

The HARDMAN Comparability Methodology, which is an integral component of the Manpower and Personnel Integration (MANPRINT) program, estimates a weapon system's manpower, personnel, and training (MPT) requirements. The HCM can provide valuable MPT information to Army decision makers during the entire weapon system acquisition process.

The HCM can contribute to many Army MPT processes and documents, including:

- Army Training and Evaluation Program (ARTEP)
- Basis of Issue Plan (BOIP)
- Course Revision Plan (CRP)
- Qualitative and Quantitative Personnel Requirements Information (QQPRI)
- System Training Plan (STRAP)
- New Equipment Training Plan (NETP)
- Army System Acquisition Review Councils (ASARC)
- Logistic Support Analysis (LSA), MIL-STD-1388-1A
- System MANPRINT Management Plan (SMMP)
- Individual Training Strategy (ITS)
- Army Extension Training Information System (AETIS)

The HCM analysis team can make recommendations concerning any of the data elements contained in these documents: however, the Army has final control of the MPT documents. The relationship between MPT documents and the HCM is reciprocal. Depending on the New System's location in the weapon system acquisition process, the HCM analysis team will either obtain information from these documents or produce results that could feed these documents. The HCM analysis results could be viewed as a test of the data in an MPT document. HCM Tradeoff Analysis can be used to consider alternatives.

The HCM MPT documents crosswalk on the following pages lists the products of Step 4 by action step and the MPT documents that require similar information.

HCM-MPT DOCUMENT CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS

Substep	Action Step	HCM Products	MPT Documents
4.1	1	• Operator and Maintainer Training Source Indexes	
	2	• New System Training Concept	• STRAP • ITS
4.2	1	• Predecessor System Tasks	• LSA
	2	• BCS Tasks	• LSA
	3	• Proposed System Tasks	• LSA • AETIS • QQPRI • ARTEP
	4	• Tasks Assigned to Training	• LSA • AETIS • NETP • ARTEP
4.3	1	• Predecessor System Programs of Instruction	
	2	• BCS Programs of Instruction	
	3	• Proposed System Quasi-Programs of Instruction	• NETP • ITS • QQPRI • STRAP • CRP
	4	• ASVAB Prerequisites	• CRP • QQPRI

HCM-MPT DOCUMENT CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS (Continued)

Substep	Action Step	Data Elements	MPT Documents
4.4	1	• Training Devices and Equipment	• ITS • STRAP • NETP
	2	• Petroleum, Oils, Lubricants	
	3	• Ammunition	• ITS
	4	• Facilities	• ITS • NETP
4.5	1 & 2	• Course Resource Data (Student Input, Course Attrition Rate, Modal Grades, Course Length, Optimum Class Size, Course Type, and One Time Instructor Contact Hours)	• ITS • NETP • CRP
4.6	1	• Normalized Graduates	
	2	• Student Input	• ITS • STRAP • NETP
4.7	1	• Training Man-Days	• NETP
	2 & 3	• Number of Instructors	• NETP

HCM-MPT DOCUMENT CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS (Continued)

Substep	Action Step	Data Elements	MPT Documents
4.8	1	• Fixed and Variable Cost Percentages	
	2	• Cost per Graduate	• NETP
	3	• Annual Course Costs	• NETP • STRAP
4.9	1 & 2	• Unit Training Products	• STRAP • AETIS

Procedure 1 Example (continued)

NTDICIV = 2233 + 1342

= 3575

NTDINP = 2883 + 2510

= 5393

NTDIOTH = 6

NTDINF = 397 + 239

= 636

TOTAL TRAINING COST PER GRADUATE

NTTCPG = 18833 + 3575 + 5393 + 6 + 636

= 28443

Action Step 3: Determine Annual Course Costs

Discussion

The analyst's objective in this action step is to calculate the annual cost to conduct each course that supports the New System. The analyst calculates the annual course costs using the Total Training Cost per Graduate and the annual number of graduates each system alternative requires.

The analyst must also apply inflation indices to adjust the annual course cost results from the fiscal year (FY) in which the ATRM-159 report was published to the HCM analysis year. For example, if the latest ATRM-159 report reflected FY85 cost data adjusted to FY87 dollars and the HCM analysis is completed in FY89, the analyst must apply inflation indices to convert the annual course cost dollars from FY87 to FY89. The inflation indices used in this action step are published in a letter (Subject: Inflation Tables and Guidance) by the Management Directorate (Office Symbol: ATRM-MR), TRADOC Deputy Chief of Staff Resource Management (DSCRM).

Procedures

1. **Calculate Annual Course Costs.**
   - From Substep 4.6, obtain either the Number of Predecessor System Norm Grads (PNG) or the Number of System-Specific Norm Grads (SNG) for each course.
   - Apply the following equation to Predecessor System courses:

     Annual Course Costs = TTCPG x PNG
   - Apply the following equation to BCS and Proposed System courses:

     Annual Course Costs = NTTCPG x SNG
2. **Apply Inflation Indices.**
   - Obtain the current TRADOC letter (Subject: Inflation Tables and Guidance) on inflation indices from the DCSRM Management Directorate (ATRM-MR).
   - In the TRADOC letter, find any one of the non-pay (purchases) tables, e.g., Operation and Maintenance, Army, Military Construction, Army, etc.

- Determine the fiscal year that the ATRM-159 reports reflect (e.g., FY85 training/FY 87 dollars).
- Find the compound index in the dollar's base year (BY) line by moving to the column for the desired fiscal year. For example, if the HCM analysis year is FY89 and the ATRM-159 report dollars are FY87, find the base year for 1987 (BY: 87). Find the compound indices line and move to the 89 column.

NOTE

The HCM uses compound indices. The compound rate is the basic inflation index without regard for the outlay rate of a fund. As is seen on all of the tables, the compound indices are the same.

- Multiply the annual course costs by the compound index.

Procedure 1 Example

Using 101-31E10 course information, the analyst calculates the following values:

BCS Annual Course Cost = $28,443 x 45
= $1,279,935

Predecessor System Annual Course Cost = $28,084 x 47
= $1,319,948

Procedure 2 Example

Using the TRADOC inflation indices, the analyst inflates the annual course costs (in FY87 dollars) to FY89:

BCS Annual Course Costs (FY89) = $1,279,935 x 1.0712
= $1,371,066

Precedessor System Annual Course Cost (FY89) = $1,319,948 x 1.0712
= $1,413,928

Substep 4.9: Determine Unit Training Products

Overview

In this substep the analyst estimates the New System's requirement for unit training products. Unit training products are training materials and literature that are provided to a weapon system's operators and maintainers in their units. Figure 4.9-1 is an overview of this substep.

The analyst describes each training product; determines the number of products required; and estimates the cost of developing, producing, and distributing each product. Table 4.9-1 lists Army training products and their codes.

The analyst uses the BCS tasks and the unit training products identified for each task from Substep 4.2. The analyst also uses available descriptions of existing training products.

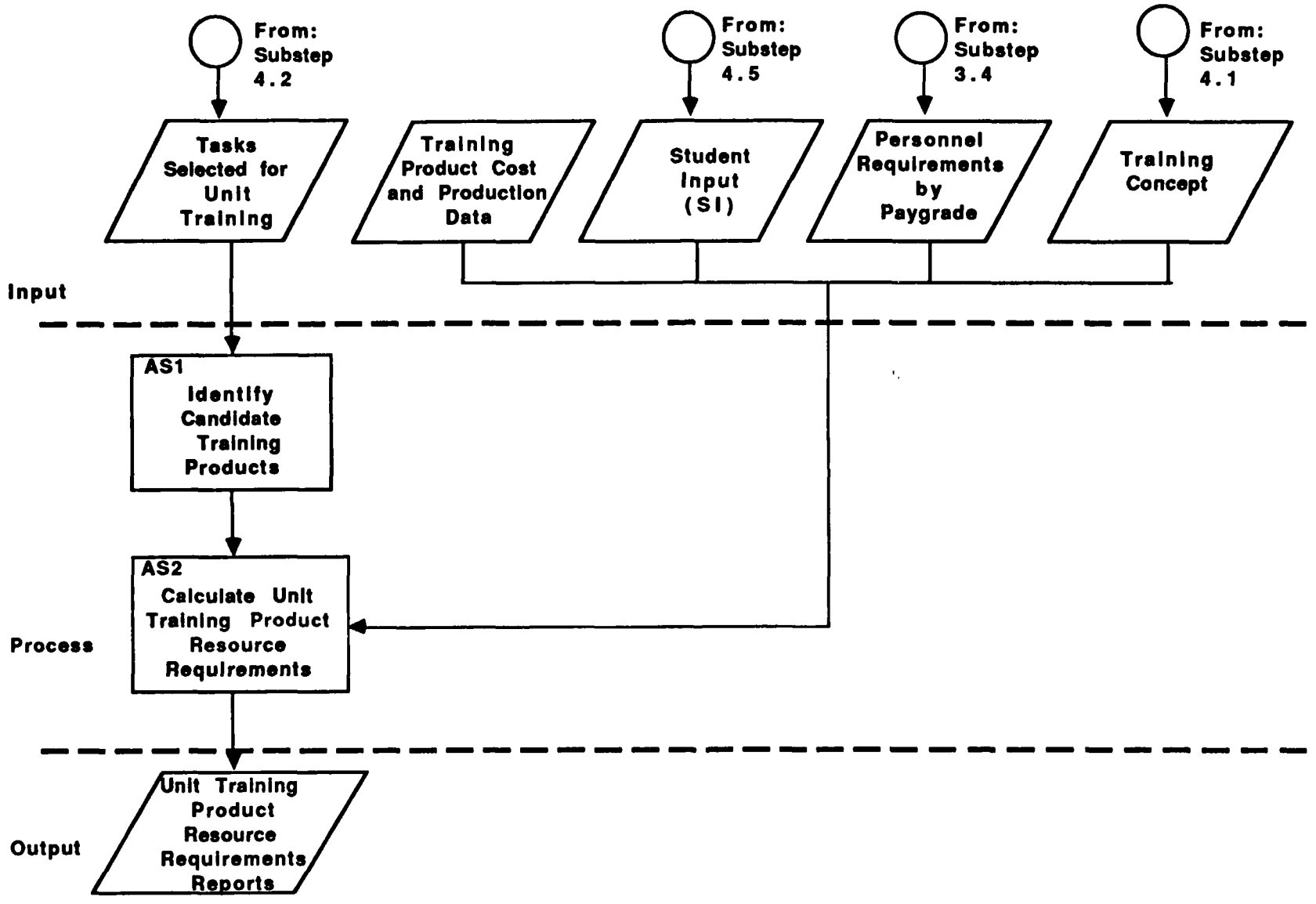

Figure 4.9-1. Overview of Substep 4.9, Determine Unit Training Products.

Table 4.9-1. Training Products and Their Codes

CODE	TRAINING PRODUCT/LITERATURE	EXAMPLE
ACCP	Army Correspondence Course Programs Correspondence Course Subcourses	113-153-148-028 SSO309
ARTEP	Army Training and Evaluation Programs	ARTEP 11-35
DA Pam	Department of Army Pamphlets	DA Pam 10-5
FM	Field Manuals	FM 11-66
FS	Filmstrips	FS 16-211
GTA	Graphic Training Aids	GTA 11-2-1 (T,C)
JB	Job Books	TC 11-31E1/2 JB
MF	Miscellaneous Films	MF 11-147
RCSC	Reserve Component School Course Materials	690-63J10-RC
REM	Resident Exportable Materials	IMA ST 31-187
SB	Supply Bulletins	SB 710-1-1
SFS	Sound Filmstrips	SFS 19-14
SL	Slide Kits	SL 32-7-1
SPA	Skill Performance Aids	040-061-7049-L
SQT	Skill Qualification Tests	31E1-V5
STP	Soldier Training Products	STP 34-96D1-SM
TB	Technical Bulletins	TB 750-1
TC	Training Circulars	TC 11-4
TEC	Training Extension Courses	101-113-4775-A
TF	Training Films (Doctrine)	TF 11-2747
TM	Technical Manuals	TM 11-5815-334-12
TVT	Television Videotapes	TVT 6-103

Action Step 1: Identify Candidate Training Products

Discussion

In this action step the analyst compiles a list of candidate training products for the New System. This list includes appropriate training materials and literature from the Predecessor System and training products required by comparable equipment components that may represent developmental requirements. Table 4.9-2 lists sources of training product descriptions.

Procedures

1. **Identify Known Training Products.**
   - Obtain from Substep 4.2 each MOS's BCS tasks and the training products identified for each task. Training products are listed as references.
   - For each MOS, record a list of training products on Worksheet 4.9-1. Determine the title of each product by consulting the references in the Trainer's Guide or Soldier's Manual from which the task was derived.
2. **Identify Other Existing Training Products.**
   - Review Table 4.9-3 to identify other existing training products. Survey comparable weapon system training products.
   - List the products on Worksheet 4.9-1.

Table 4.9-2. Sources of Training Product Descriptions

AETIS	Army Extension Training Information System
STRAP	System Training Plan (STRAP) from the appropriate TRADOC School New System Training Office (NSTO)
TRADOC Pam 310-3	TRADOC Armywide Doctrinal and Training Literature
DoD 5040.2	DoD Catalog of Audiovisual (AV) Production
DA Pam 25-30	Consolidated Index of Army Publications and Blank Forms
DA Pam 350-100	Extension Training Materials Consolidated MOS Catalog
DA Pam 310-32	Index of Graphic Training Aids (GTAs)
DA Pam 351-20	Army Correspondence Course Program Catalog

Table 4.9-3. Training Product Descriptions and Their Sources

Code	Training Product/Literature	AETIS	STRAP	TRADOC Pam 310-3	DoD 5040.2	DA Pam 25-30	DA Pam 350-100	DA Pam 310-32	DA Pam 351-20
ACCP	Army Correspondence Course Programs	•	•						•
ARTEP	Army Training and Evaluation Programs		•	•		•			
DA Pam	Department of Army Pamphlets			•		•			
FM	Field Manuals	•		•		•			
FS	Filmstrips	•	•		•		•		
GTA	Graphic Training Aids	•	•		•		•	•	
JB	Job Books	•				•			
MF	Miscellaneous Films	•	•		•		•		
RCSC	Reserve Component School Course Materials	•	•						
SB	Supply Bulletins					•			
SFS	Sound Filmstrips	•	•		•		•		
SL	Slide Kits	•	•		•		•		
SPA	Skill Performance Aids	•							
SQT	Skill Qualification Tests	•	•						
STP	Soldier Training Publications		•			•			
TB	Technical Bulletins			•		•			
TC	Training Circulars	•		•		•			
TEC	Training Extension Courses	•	•				•		
TF	Training Films (Doctrine)	•	•		•		•		
TM	Technical Manuals			•		•			
TVT	Television Videotapes	•	•		•		•		

Procedure 1 and 2 Examples

The New System requires a new operator MOS 19X. The analyst obtains the BCS tasks for this new MOS from Substep 4.2. The analyst records the references for each task in a list of candidate Army training products and literature. The analyst then obtains the training product sources in Table 4.9-2 and reviews them to identify additional training products. The final candidate list of training products is shown below.

MOS: 19X

Product: Army Correspondence Course Programs

Product Code	Product Title
ARO 100	Operator/Crew Maintenance Fundamentals
ARO 452	Tank Gunnery-Conduct of Fire
ARO 465	Mine Warfare, Basic

Product: Field Manuals

Product Code	Product Title
FM 17-12	Tank Gunnery (How To Fight)
FM 17-95	Cavalry (How to Fight)
FM 21-60	Visual Signals

Product: Graphic Training Aids

Product Code	Product Title
GTA 3-6-3	NBC Warning and Reporting System
GTA 5-2-12	Coordinate Scale and Protractor
GTA 5-10-27	Mine Card

Product: Training Extension Course

Product Code	Product Title
TEC 931-171-0301-F	Prepare M60-Series Tank or M551 ARAAV for NBC Attack; Part 1
TEC 947-071-0180-F	Familiarize and Arm M16A1 Anti-Personnel Mine (pressure role)

(continued)

Procedure 1 and 2 Examples (continued)

Product Code	Product Title
Product: Technical Manuals	
TM 9-2350-215-10-3	Operator's Manual: Troubleshooting and Maintenance for Tank, Combat, Full Tracked: 105MM Gun, M60A1 and M60A1 (AOS).
TM 9-2350-255-10-3	Operator's Manual for Troubleshooting and Maintenance for Tank, Combat, Full Tracked: 105MM Gun, M1.
TM 11-5820-401-10-1	Operator's Manual: Radio Sets AN/VRC-12, AN/VRC-43, AN/VRC-44, AN/VRC-45, AN/VRC-46, AN/VRC-47, AN/VRC-48, and AN/VRC-49 (used without an intercom system).

Action Step 2: Calculate Unit Training Product Resource Requirements

Discussion

In this action step the analyst calculates the resource requirements of unit training products. The costs associated with creating, printing, and distributing unit training products can be substantial. These costs often remain hidden until late in the decision-making process, thereby lessening a decision maker's ability to make informed decisions.

The amount of production or revision is primarily a result of changes to the equipment design, MOS assignment, maintenance concept, or training concept.

This unit training product cost estimate meets the requirements of TRADOC Reg 351-6, *Support of Training in Units*, and TRADOC Reg 351-9, *System Training Plan (STRAP)*.

Procedures

1. **Assign Each Training Product to a Product Type.**
   - Record on Worksheet 4.9-2 the MOS and the reason for change. Indicate whether the change is due to a product improvement program or a new system.
   - Using Table 4.9-4 as a guide, record the unit training products by product type on Worksheet 4.9-2.
2. **Calculate Unit Training Product Costs.**
   - Use Table 4.9-5 to identify the production costs, reprint costs, and postal fees for each training product. Record these costs on Worksheet 4.9-2 (columns a, c, and e).
   - Estimate the number of production units (i.e., pages, minutes, frames) that require modification. Use the results of Substeps 4.1 and 4.2 and any other applicable information (e.g., the Design Difference Index). Record these production units on Worksheet 4.9-2, column b.
   - Contact the points of contact listed in Table 4.9-6 to determine the quantities of training products that will be needed to replace all existing products in the active and reserve components.

Table 4.9-4. Unit Training Product Types

PRODUCT TYPE	UNIT TRAINING PRODUCTS
Audio Visual	Interactive Video Disc (IVD) 3/4″ or 1/2″ Video Cassette Training Extension Course (TEC)
Graphic Training Aids	Beales Wheel Booklet Chart Game Playing Card Pocket Card Slide
Training Publications	Army Correspondence Course Program (ACCP) Army Mission Training Plan (AMTP) Army Training and Evaluation Program (ARTEP) Department of the Army Pamphlet (DA Pam) Field Manual (FM) Reserve Component School Course Material (RCSC) Resident Exportable Material (REM) Skill Qualification Test (SQT) Soldier Job Book (JB) Soldier Training Publication (STP) Supply Bulletin (SB) Technical Bulletin (TB) Technical Manual (TM) Trainer's Guide (TG) Training Circular (TC)

Table 4.9-5. Unit Training Product Standard Production, Reprint, and Postal Costs

PRODUCT TYPE	TRAINING PRODUCT	PRODUCTION COSTS PER UNIT	REPRINT COSTS PER UNIT	POSTAL FEES PER PRODUCT
AUDIO VISUAL	TEC	$575 Each	$2.50/Each	$.94
	3/4" or 1/2" Video Cassette	$85/Minute	$15.00/Each	$.94
	IVD	$1.02/Frame	$7.00/1-sided Disc $10.00/2-sided Disc	$.69
GRAPHIC TRAINING AIDS	Playing Cards	Contact U.S. Army Training Support Center to obtain cost estimate	$.0092/Each	Contact GTA distribution point for a cost estimate based on total quantity required
	Pocket Cards -black & white -two color		$.01/Each $.03/Each	
	Booklets		$.03/Each	
	Beales Wheels		$.08/Each	
	Chart		$1.00/Each	
	Games -type A -type B		$150.00/Each $4,648.00/Each	
TRAINING PUBLICATIONS	New Doctrine	$393.88/Page	$.00004/Page	$.77 (1-88 Pages) $.85 (89-176 Pages $.93 (177-264 Pages) $1.01(265-352 Pages)
	Modify Current Publications	$48.22/Page		

Table 4.9-6. Points of Contact for Distribution Quantities

DA Pams, STPs, JBs	U.S. Army AG Publications Center 2800 Eastern Blvd. Baltimore, MD 21220 (301) 682-8500
TMs, FMs, TBs	U.S. Army AG Publications Center 1655 Woodson Road St. Louis, MO 63114 (314) 263-7305
AMTPs, Circulars	Commander U.S. Army Materiel Development and Readiness Command 5001 Eisenhower Avenue Alexandria, VA 22333
ARTEP	U.S. Army AG Publications Center 2800 Eastern Blvd. Baltimore, MD 21220 (301) 962-7217
Graphic Training Aids	U.S. Army Training Support Center Services Directorate Ft. Eustis, VA 23604 (804) 878-2446
Audio Visual Devices	U.S. Army Audio Visual Center Tobyhanna Army Depot, PA 18466 (717) 894-7152
ACCPs	Commander U.S. Army Training Support Center ATTN: ATIC-IP, Bldg. 3306 Ft. Eustis, VA 23604
Army Reserve Component School Course Materials	Contact proponent school
Resident Exportable Materials (REM)	See DA Pam 350-100, Appendix C, School Addresses for Resident Exportable Materials
Other special training products not listed above	Commander U.S. Army Training Support Center ATTN: ATIC-ET-O Ft. Eustis, VA 23604

NOTE

The analyst may use the TAPA Force Management Books I and II and the results of HCM Step 2 to determine STP, SQT, and JB distribution quantities. The analyst uses the results of Substep 3.4 to determine REM distribution quantities.

- Record on Worksheet 4.9-2, column f, the total distribution quantity for each training product.
- For training publications, determine the number of pages that must be reprinted by multiplying the number of production units (column b) by the total quantity required (column f).

NOTE

This calculation assumes that only the new or modified pages will be reprinted and distributed. If the publication is to be totally reprinted and distributed, multiply the total length of the new publication by the total quantity required and record the results in column d.

- For all other training products, record the total quantity required (column f) in column d.
- Use the following equation to determine the total cost of each training product (column g):

  $(a \times b) + (c \times d) + (e \times f) = g$

- Enter the total MOS cost at the bottom of Worksheet 4.9-2 and repeat this process for all training products.
- Calculate a total unit training product cost by adding the cost of each MOS's training products.

Procedure 1 Example

The analyst obtains the unit training products identified in Action Step 1. Using Table 4.9-4, the analyst assigns each training product to a product type:

MOS: 19X

AUDIO VISUAL

3/4 or 1/2" Video Cassette

TVT 020-171-0017-B
TVT 643-171-0048-B

Training Extension Courses

TEC 020-171-5332-F
TEC 931-171-0301-F
TEC 931-171-0302-F
TEC 947-071-0180-F
TEC 947-071-0181-F
TEC 947-071-0182-F
TEC 947-071-0183-F

GRAPHIC TRAINING AIDS

Beales Wheels

GTA 5-10-27
GTA 17-7-2

Charts

GTA 17-6-8

Playing Cards

GTA 17-2-11

Pocket Cards

GTA 3-6-3
GTA 5-10-27

TRAINING PUBLICATIONS

Army Correspondence Course Program

ARO 100
ARO 452
ARO 465

(continued)

Procedure 1 Example (continued)

ARTEP

17-2

DA Pams

738-750

Field Manuals

FM 9-13
FM 17-12
FM 17-95
FM 21-60

Soldier Training Publications

STP 17-19D 2/3/4
STP 17-19K24-SM-TG

Technical Bulletins

TB 750-103

Training Circulars

TC 17-15-9

Technical Manuals

TM 9-2350-215-10-3
TM 9-2350-253-10
TM 9-2350-255-10-3
TM 9-2350-257-10-3
TM 9-2350-258-10
TM 11-5820-401-10-1
TM 11-5820-498-12

Procedure 2 Example

The analyst uses Table 4.9-5 to determine production costs, reprint costs, and postal fees. The analyst assumes that for all training publications only the new pages will be reprinted and distributed — not the entire publication. The analyst determines the number of reprint units (column d) by multiplying column b by column f.

The analyst examines each unit training product and, where applicable, determines the required modifications. The analyst contacts the points of contact listed in Table 4.9-6, and they provide distribution quantities.

MOS: 19X

	Estimated Amount of Modification	Total Distribution Quantity
AUDIO VISUAL		
3/4 or 1/2" Video Cassette		
TVT 020-171-0017-B	17 Minutes	94
TVT 643-171-0048-B	None	—
Training Extension Courses		
TEC 020-171-5332-F	10 Minutes	94
TEC 931-171-0301-F	None	—
TEC 931-171-0302-F	None	—
TEC 947-071-0180-F	16 Minutes	94
TEC 947-071-0181-F	None	—
TEC 947-071-0182-F	None	—
TEC 947-071-0183-F	None	—
GRAPHIC TRAINING AIDS		
Beales Wheels		
GTA 5-10-27	Not Applicable	—
GTA 17-7-2	Not Applicable	—
Charts		
GTA 17-6-8	Not Applicable	—
Playing Cards		
GTA 17-2-11	Not Applicable	—

(continued)

Procedure 2 Example (continued)

Pocket Cards		
GTA 3-6-3	Not Applicable	—
GTA 5-10-27	Not Applicable	—
TRAINING PUBLICATIONS		
Army Correspondence Course Program		
ARO 100	12 Pages	413
ARO 452	None	—
ARO 465	4 Pages	275
ARTEP		
17-2	67 Pages	4,780
DA Pams		
738-750	None	—
Field Manuals		
FM 9-13	None	—
FM 17-12	40 Pages	4,320
FM 17-95	None	—
FM 21-60	None	—
Soldier Training Publications		
STP 17-19D 2/3/4	None	—
STP 17-19K24-SM-TG	35 Pages	12,870
Technical Bulletins		
TB 750-103	None	—
Training Circulars		
TC 17-15-9	None	—
Technical Manuals		
TM 9-2350-215-10-3	None	—
TM 9-2350-253-10	None	—
TM 9-2350-255-10-3	65 Pages	1,600
TM 9-2350-257-10-3	None	—
TM 9-2350-258-10	None	—
TM 11-5820-401-10-1	137 Pages	1,600
TM 11-5820-498-12	125 Pages	1,600

Figure 4.9-2 is an example of unit training product cost calculations.

WORKSHEET 4.9-2

Use this worksheet to estimate the cost of ut training products.

MOS: 19X
Reason for Change: PIP (New System)

		(a x b) + (c x d) + (e x f) = g						
Product Type	**Training Product**	**Production Costs Per Unit**	**Number of Production Units**	**Reprint Costs Per Unit**	**Number of Reprint Units**	**Postal Fees Per Product**	**Total Quantity Required**	**Total Cost**
Audio Visual	TVT 020-171-0017-B	$85/minute	17	$15.00/each	94	.94	94	2,943.36
	TEC 020-171-5332-F	$575/each	1	$2.50/each	94	.94	94	898.36
	TEC 947-071-0180-F	$575/each	1	$2.50/each	94	.94	94	898.36
Training Publications	ARO 100	48.22/pg	12	.00004/pg	4,956	.77	413	896.85
	ARO 465	48.22/pg	4	.00004/pg	1,100	.77	275	404.67
	ARTEP 17-2	48.22/pg	67	.00004/pg	320,260	.77	4,780	6,924.15
	FM 17-12	48.22/pg	40	.00004/pg	172,800	.77	4,320	5,262.11
	STP 17-19K24-SM-TG	48.22/pg	35	.00004/pg	447,300	.77	12,870	11,615.49
	TM 9-2350-255-10-3	393.88/pg	65	.00004/pg	104,000	.77	1,600	26,838.36
	TM 11-5820-401-10-1	393.88/pg	137	.00004/pg	219,200	.77	1,600	55,202.33
	TM 11-5820-498-12	393.88/pg	125	.00004/pg	200,000	.77	1,600	50,475.00
							TOTAL:	$162,359.04

Figure 4.9-2. Example of unit training product cost calculations.

SUBSTEP 4.9
WORKSHEETS

WORKSHEET 4.9-1

Use this worksheet to document a list of candidate training products.

MOS: _____

Training Product	Product Code	Product Title

WORKSHEET 4.9-2

Use this worksheet to estimate the cost of unit training products.

MOS: _____
Reason for Change: **PIP** **New System**

		(a x b) + (c x d) + (e x f) = g						
Product Type	**Training Product**	**Production Costs Per Unit**	**Number of Production Units**	**Reprint Costs Per Unit**	**Number of Reprint Units**	**Postal Fees Per Product**	**Total Quantity Required**	**Total Cost**
							TOTAL:	

APPENDIX C: HCM-MIST CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS

A direct translation of HARDMAN Comparability Methodology (HCM) substeps and action steps to the Man Integrated Systems Technology (MIST) procedures and worksheets is not possible. MIST is not an "automated HARDMAN"; however, it is an automated methodology that uses the same input, performs similar calculations, and generates many of the same products.

The HCM consists of many step-by-step procedures that must be completed sequentially to generate products. MIST, through automation, combines many of these step-by-step procedures. This combination of procedures is possible because MIST performs all procedures involving mathematical computations. In addition, MIST automatically hands off and receives input/output generated by other procedures within the methodology.

MIST is not as complete as the HCM. For example, MIST does not directly determine operator requirements as does the HCM. MIST also does not compute the Standards of Grade Authorizations and is limited in its ability to handle complex force structures.

The following pages contain a crosswalk between the HCM and MIST. As explained above, the links are not direct. They indicate areas where similar parameters are being considered.

HCM - MIST CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS

Substep	Action Step	Data Elements	MIST Worksheets/Models
4.1	1	• Operator and Maintainer Training Source Indexes	• Operator Training Data Source Index (SRA230) • Maintainer Training Data Source Index (SRA240)
	2	• New System Training Concept	• None
4.2	1	• Predecessor System Tasks	• Predecessor Task Input (SRA220)
	2	• BCS Tasks	• Comparable Task Input (SRA221) • BCS Task Generation (SRA250)
	3	• Proposed System Tasks	• Comparable Task Input (SRA221) • New Configuration Task Generation (SRA260)
	4	• Tasks Assigned to Training	• Task Selection Factors (SRA289) • New Configuration Task Evaluation (SRA290)
4.3	1	• Predecessor System Programs of Instruction	• Course Input (SRA295) • Course Modification (SRA300)
	2	• BCS Programs of Instruction	• Course Input (SRA295) • Course Modification (SRA300)
	3	• Proposed System Quasi-Programs of Instruction	• Course Input (SRA295) • Course Modification (SRA300)
	4	• ASVAB Prerequisites	• Course Modification, Part II (SRA301)

HCM-MIST CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS (continued)

Substep	Action Step	Data Elements	MIST Worksheets/Models
4.4	1	• Training Devices/Equipment	• Predecessor Task Input (SRA220) • Comparable Task Input (SRA221) • BCS Task Generation (SRA250) • New Configuration Task Generation (SRA260)
	2	• Petroleum, Oil, and Lubricant Requirements	• None
	3	• Ammunition Requirements	• None
	4	• Facility Requirements	• None
4.5	1 & 2	• Course Resource Data (Student Input, Course Attrition Rate, Modal Grades, Course Length, Optimum Class Size, Course Type, and One Time Instructor Contact Hours)	• Training Resource (SRA310, 311, 312)
4.6	1	• Normalized Graduates	• Training Cost and Resources
	2	• Student Input	• Training Resource (SRA310)
4.7	1	• Training Man-Days	• Training Cost and Resources
	2 & 3	• Number of Instructors	• Training Cost and Resources

HCM-MIST CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS (continued)

Substep	Action Step	Data Elements	MIST Worksheets/Models
4.8	1	• Fixed and Variable Cost Percentages	• Training Cost and Resources
	2	• Cost per Graduate	• Training Cost and Resources
	3	• Annual Course Costs	• Training Cost and Resources
4.9	1 & 2	• Unit Training Products	• None

APPENDIX D: HCM MPT DOCUMENTS CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS

The HARDMAN Comparability Methodology, which is an integral component of the Manpower and Personnel Integration (MANPRINT) program, estimates a weapon system's manpower, personnel, and training (MPT) requirements. The HCM can provide valuable MPT information to Army decision makers during the entire weapon system acquisition process.

The HCM can contribute to many Army MPT processes and documents, including:

- Army Training and Evaluation Program (ARTEP)
- Basis of Issue Plan (BOIP)
- Course Revision Plan (CRP)
- Qualitative and Quantitative Personnel Requirements Information (QQPRI)
- System Training Plan (STRAP)
- New Equipment Training Plan (NETP)
- Army System Acquisition Review Councils (ASARC)
- Logistic Support Analysis (LSA), MIL-STD-1388-1A
- System MANPRINT Management Plan (SMMP)
- Individual Training Strategy (ITS)
- Army Extension Training Information System (AETIS)

The HCM analysis team can make recommendations concerning any of the data elements contained in these documents: however, the Army has final control of the MPT documents. The relationship between MPT documents and the HCM is reciprocal. Depending on the New System's location in the weapon system acquisition process, the HCM analysis team will either obtain information from these documents or produce results that could feed these documents. The HCM analysis results could be viewed as a test of the data in an MPT document. HCM Tradeoff Analysis can be used to consider alternatives.

The HCM MPT documents crosswalk on the following pages lists the products of Step 4 by action step and the MPT documents that require similar information.

HCM-MPT DOCUMENT CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS

Substep	Action Step	HCM Products	MPT Documents
4.1	1	• Operator and Maintainer Training Source Indexes	
	2	• New System Training Concept	• STRAP • ITS
4.2	1	• Predecessor System Tasks	• LSA
	2	• BCS Tasks	• LSA
	3	• Proposed System Tasks	• LSA • AETIS • QQPRI • ARTEP
	4	• Tasks Assigned to Training	• LSA • AETIS • NETP • ARTEP
4.3	1	• Predecessor System Programs of Instruction	
	2	• BCS Programs of Instruction	
	3	• Proposed System Quasi-Programs of Instruction	• NETP • ITS • QQPRI • STRAP • CRP
	4	• ASVAB Prerequisites	• CRP • QQPRI

HCM-MPT DOCUMENT CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS (Continued)

Substep	Action Step	Data Elements	MPT Documents
4.4	1	• Training Devices and Equipment	• ITS • STRAP • NETP
	2	• Petroleum, Oils, Lubricants	
	3	• Ammunition	• ITS
	4	• Facilities	• ITS • NETP
4.5	1 & 2	• Course Resource Data (Student Input, Course Attrition Rate, Modal Grades, Course Length, Optimum Class Size, Course Type, and One Time Instructor Contact Hours)	• ITS • NETP • CRP
4.6	1	• Normalized Graduates	
	2	• Student Input	• ITS • STRAP • NETP
4.7	1	• Training Man-Days	• NETP
	2 & 3	• Number of Instructors	• NETP

HCM-MPT DOCUMENT CROSSWALK FOR TRAINING RESOURCE REQUIREMENTS ANALYSIS (Continued)

Substep	Action Step	Data Elements	MPT Documents
4.8	1	• Fixed and Variable Cost Percentages	
	2	• Cost per Graduate	• NETP
	3	• Annual Course Costs	• NETP • STRAP
4.9	1 & 2	• Unit Training Products	• STRAP • AETIS